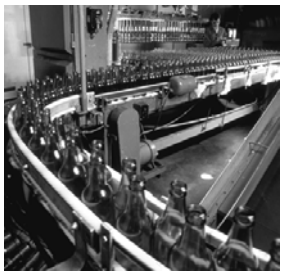
LISTEN.
THINK.
SOLVE.SM

PowerFlex® 700S / 700H Adjustable Frequency AC Drives



FRAME 10 HARDWARE SERVICE MANUAL

200-250 kW, 400V
300-450 HP, 480V
250-450 HP, 600V
250-400 kW, 690V

ALLEN-BRADLEY • ROCKWELL SOFTWARE

Rockwell Automation

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls* (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at **http://www.rockwellautomation.com/literature**) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

Reproduction of the contents of this manual, in whole or in part, without written permission of Rockwell Automation, Inc. is prohibited.

Throughout this manual, when necessary we use notes to make you aware of safety considerations.

WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

Important: Identifies information that is critical for successful application and understanding of the product.

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequences.

Shock Hazard labels may be located on or inside the equipment (e.g., drive or motor) to alert people that dangerous voltage may be present.

Burn Hazard labels may be located on or inside the equipment (e.g., drive or motor) to alert people that surfaces may be at dangerous temperatures.

Manual Updates

Current Revision

This information summarizes the changes made to the *PowerFlex® 700S and 700H Drives Frame 10 - Hardware Service Manual*, publication PFLEX-TG002..., since the April 2007 release.

Change	See Page...
Updated the 700S and 700H faults.	1-2
Removed the “Diagnostic Procedures by Symptom” diagrams and replaced them with the new “Common Drive Conditions and Corrective Actions” tables.	1-17
Added the “Technical Support Options” section.	1-19
Removed the “Active” Gate Driver Board measurements procedures from Chapter 2.	
Updated the “Checking the Rectifying Module” procedures to include the new Series B Rectifying board.	2-9
Added procedure for removing the precharging resistors on series B rectifiers.	3-32
Updated the “Start-Up After Repair” procedures.	4-1
Updated the “Right-Hand Side” and “Left-Hand Side Power Structure” spare parts lists.	C-4

Previous Revision

This information summarizes the changes made to the *PowerFlex® 700S and 700H Drives Frame 10 - Hardware Service Manual*, publication PFLEX-TG002..., since the July 2005 release.

Change	See Page...
Updated the 700S hardware faults	1-2
Removed references to brake option in the “Conducting Forward and Reverse Biased Diode Tests for Major Power Components” (brake option not available on PowerFlex 700H/S Frame 10 drives)	2-3
Added Removal of PowerFlex 700S Phase II Control	3-6
Added the Removal of the Common Mode Filter Board	3-9
Updated the Circuit Board Connections Schematics to include the X50 Terminal Block and Common Mode Filter circuit board	B-1
Updated the Spare Parts Lists for the Disassembly / Assembly Drawings	C-1
Added an Index	Index-1

Notes:

Chapter 3 Access Procedures

Chapter 4 Start-Up After Repair

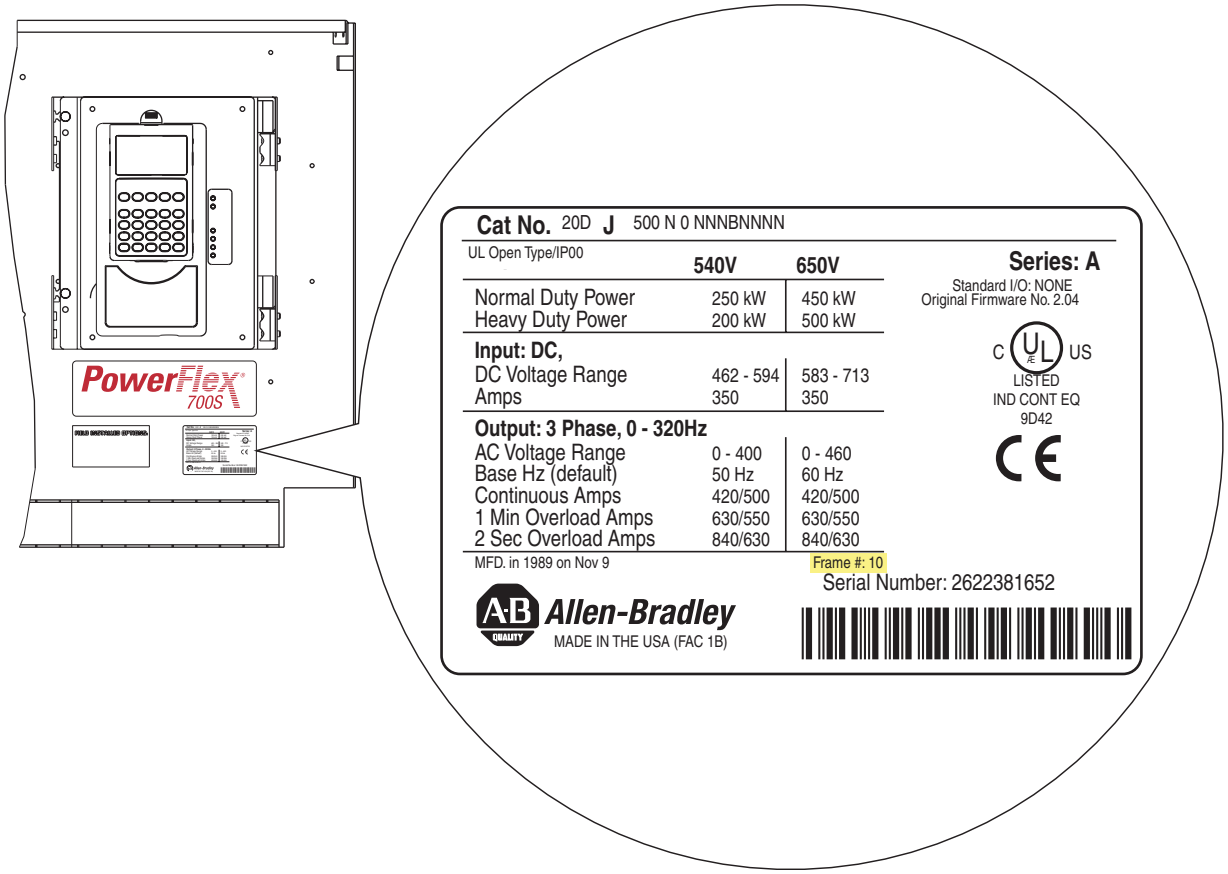
Overview

Who Should Use this Manual?

This manual is intended for qualified service personnel responsible for troubleshooting and repairing high power PowerFlex 700S and 700H AC Drives. You should have previous experience with, and basic understanding of, electrical terminology, procedures, required troubleshooting equipment, equipment protection procedures and methods, and safety precautions.

What is in this Manual

This manual contains hardware service information for Frame 10 PowerFlex 700S and 700H drives only. Verify that you are working on a Frame 10 drive by checking the data nameplate on the Control Frame. The frame number is printed just above the serial number.



What is Not in this Manual

This manual does not contain in depth installation and fault information for troubleshooting. Troubleshooting information is available in publications 20C-PM001…, *Programming Manual - PowerFlex 700H Adjustable Frequency AC Drive*, 20D-UM001…, *User Manual - PowerFlex 700S Drive with Phase I Control*, or 20D-UM006…, *User Manual - PowerFlex 700S Drive with Phase II Control*. Complete installation information is available in publication PFLEX-IN006…, *Installation Instructions - PowerFlex 700S and 700H Adjustable Frequency AC Drive*.

Reference Materials

Allen-Bradley publications are available on the internet at *www.rockwellautomation.com/literature*.

The following publications provide general drive information.

Title	Publication
Wiring and Grounding Guide, (PWM) AC Drives	DRIVES-IN001...
Safety Guidelines for the Application, Installation and Maintenance of Solid State Control	SGI-1.1
A Global Reference Guide for Reading Schematic Diagrams	100-2.10
Guarding Against Electrostatic Damage	8000-4.5.2

The following publications provide specific PowerFlex drive information.

Title	Publication
Programming Manual - PowerFlex 700H AC Drive	20C-PM001...
User Manual - PowerFlex 700S Drive with Phase I Control	20D-UM001...
User Manual - PowerFlex 700S Drive with Phase II Control	20D-UM006...
Installation Instructions - Hi-Resolution Feedback Option Card for PowerFlex 700S Drives	20D-IN001...
Installation Instructions - Multi Device Interface Option for PowerFlex 700S Drives	20D-IN004...
Installation Instructions - Main Control Board PowerFlex 700S Drives	20D-IN005...
Installation Instructions - PowerFlex 700S /700H High Power Maintenance Stand	20D-IN014...
Installation Instructions - PowerFlex 700S and 700H Drives	PFLEX-IN006...
Reference Manual - PowerFlex Adjustable Frequency Drive with Phase I Control	PFLEX-RM002...
Reference Manual - PowerFlex Adjustable Frequency Drive with Phase II Control	PFLEX-RM003...

The following publications provide information that is necessary when applying the DriveLogix Controller.

Title	Publication
User Manual - DriveLogix System	20D-UM002...
Installation Instructions - DriveLogix Controller	20D-IN002...
Installation Instructions - Memory Expansion for DriveLogix Controller	20D-IN007...
ControlNet Daughtercard Installation Instructions (Catalog Numbers 1788-CNC and 1788-CNCR)	1788-IN002...
ControlNet Daughtercard Installation Instructions (Catalog Numbers 1788-CNF and 1788-CNFR)	1788-IN005...

Understanding Manual Conventions

Terms

The following words are used throughout the manual to describe an action:

Word	Meaning
Can	Possible, able to do something
Cannot	Not possible, not able to do something
May	Permitted, allowed
Must	Unavoidable, you must do this
Shall	Required and necessary
Should	Recommended
Should Not	Not recommended

Cross References

"Figure 2.2 on page 2-6" is a cross reference to figure 2.2 on page 5 of Chapter 2.

"Figure C.1 on page C-2" is a cross reference to figure C.1 on page 2 of Appendix C.

Additional Support Available on Internet

Additional troubleshooting information and software tools are available on the Allen-Bradley Drives Support Website (*http://www.ab.com/support/abdrives/*).

General Precautions

Class 1 LED Product

ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into module ports or fiber-optic cable connectors.

ATTENTION: The sheet metal cover and mounting screws on the ASIC Board located on the power structure are energized at (-) DC bus potential high voltage. Risk of electrical shock, injury, or death exists if someone comes into contact with the assembly.

ATTENTION: This drive contains **ESD** (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference A-B publication 8000-4.5.2, “Guarding Against Electrostatic Damage” or any other applicable ESD protection handbook.

ATTENTION: An incorrectly applied or installed drive can result in component damage or a reduction in product life. Wiring or application errors, such as, undersizing the motor, incorrect or inadequate AC supply, or excessive ambient temperatures may result in malfunction of the system.

ATTENTION: Only **qualified personnel** familiar with high power PowerFlex 700S and 700H Drives and associated machinery should plan or implement the installation, start-up and subsequent maintenance of the system. Failure to comply may result in personal injury and/or equipment damage.

ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged completely before servicing. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC and -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all three measurements.

ATTENTION: Potentially fatal voltages may result from improper usage of an oscilloscope and other test equipment. The oscilloscope chassis may be at a potentially fatal voltage if not properly grounded. If an oscilloscope is used to measure high voltage waveforms, use only a dual channel oscilloscope in the differential mode with X 100 probes. It is recommended that the oscilloscope be used in the A minus B Quasi-differential mode with the oscilloscope chassis correctly grounded to an earth ground.

Troubleshooting and Error Codes

ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into module ports or fiber-optic cable connectors.

ATTENTION: The sheet metal cover and mounting screws on the ASIC board located on the power structure are energized at (-) DC bus potential high voltage. Risk of electrical shock, injury, or death exists if someone comes into contact with the assembly.

ATTENTION: This drive contains **ESD** (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference A-B publication 8000-4.5.2, “Guarding Against Electrostatic Damage” or any other applicable ESD protection handbook.

ATTENTION: Only **qualified personnel** familiar with high power PowerFlex 700S and 700H Drives and associated machinery should plan or implement the installation, start-up and subsequent maintenance of the system. Failure to comply may result in personal injury and/or equipment damage.

ATTENTION: To avoid an electric shock hazard, verify that all input power has been removed from the drive and the voltage on the bus capacitors has discharged completely before servicing. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC and -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all three measurements.

ATTENTION: Potentially fatal voltages may result from improper usage of an oscilloscope and other test equipment. The oscilloscope chassis may be at a potentially fatal voltage if not properly grounded. If an oscilloscope is used to measure high voltage waveforms, use only a dual channel oscilloscope in the differential mode with X 100, isolated probes. It is recommended that the oscilloscope be used in the A minus B Quasi-differential mode with the oscilloscope chassis correctly grounded to an earth ground.

ATTENTION: HOT surfaces can cause severe burns. **Do not** touch the heatsink surface during operation of the drive. After disconnecting power allow time for cooling.

Creating Fault Reports

Clear and complete fault reports are critical for analysis and repair of modules returned to the factory.

At a minimum, perform and record the following:

- Record the contents of the fault queue (faults and times of occurrence)
- Make record of any burn marks on the rectifying module, DC-capacitors, inverter bridge, charging resistors, balancing/precharging resistors, printed circuit boards, bus bars, cabling and fiber-optic cabling
- Make record of any liquid and condensation marks on printed circuit boards, components and mechanical parts
- Make record of the amount of dust and other additional particles on drive and drive components
- Make record of any mechanical damage to the drive and drive components
- Record the size and type of main fuses
- Record any other important marks and damage

Addressing 700S Faults

No.	Name	Description	Action *(if appropriate)*
1	Abs Ovespd Det	Motor speed has exceeded the limits set in parameters 75 [Rev Speed Limit], 76 [Fwd Speed Limit] and 335 [Abs OverSpd Lim]	• Check to see if the encoder feedback polarity is correct. • Check to see if the drive is in torque mode, selected in parameter 110 [Speed/ TorqueMode] value 2 “Torque Ref”. If the drive is in torque mode, verify that there is a load present. • Verify min./max. settings in parameters 75 [Rev Speed Lim] and Par 76 [Fwd Speed Lim]. Check to see if the load is overhauling. If it is overhauling, turn the bus regulator off using parameter 414 [Brake/Bus Cnfg] bit 2 “BusRef High”.
2	Vref Decel Fail	The value of parameter 301 [Motor Spd Ref] has failed to decrease during a ramp to zero speed stop.	• This may be due to a speed trim from parameters 21 [Speed Trim 1], 22 [Speed Trim 2] or 23 [Speed Trim 3].
3	Encoder 0 Loss	One of the following has occurred on encoder 0: • missing encoder (broken wire) • quadrature error • phase loss	• Reconnect encoder or replace encoder. • Configured with parameters 365 [Fdbk LsCnfg Pri], 366 [Fdbk LsCnfg Alt], and 367 [Fdbk LsCnfgPosit]
4	Encoder 1 Loss	One of the following has occurred on encoder 1: • missing encoder (broken wire) • quadrature error • phase loss	• Reconnect encoder or replace encoder. • Configured with parameters 365 [Fdbk LsCnfg Pri], 366 [Fdbk LsCnfg Alt], and 367 [Fdbk LsCnfgPosit]

No.	Name	Description	Action *(if appropriate)*
5	Opt Port 0 Loss	A fault on port 0 of the Hi-Resolution Encoder Feedback Option Card, MDI Option Card, Heidenhain, or Resolver Feedback Option Card has occurred. • Parameter 260 [Stegmann0 Status] displays the fault status for port 0 of the Hi-Resolution Encoder Feedback Option Card. • Parameter 264 [Heidenhain0 Stat] displays the fault status for port 0 of the Heidenhain Feedback Option Card. • Parameter 269 [Resolver0 Status] displays the fault status for port 0 of the Resolver Feedback Option Card.	• Reconnect encoder or replace encoder • Reconnect option feedback card • Configured with parameters 365 [Fdbk LsCnfg Pri], 366 [Fdbk LsCnfg Alt], and 367 [Fdbk LsCnfgPosit]
6	Opt Port 1 Loss	The Linear sensor portion of the MDI feedback option card has detected a fault condition. • Parameter 286 [Linear1 Status] displays the fault status for linear portion of the MDI feedback Option Card.	• Reconnect encoder or replace encoder • Reconnect option feedback card • Configured with parameters 365 [Fdbk LsCnfg Pri], 366 [Fdbk LsCnfg Alt], and 367 [Fdbk LsCnfgPosit]
7	Params Defaulted	All parameters are reset to default by user.	(Informational only.)
8	SLink HW Fail	A fault on loading SynchLink firmware into FPGA on Main Control Board at power up.	• Replace Main Control Board
9	SLink Comm Fail	A SynchLink communication fault has occurred. • Parameter 902 [SL Error Status] displays SynchLink errors.	• Verify the SynchLink configuration in parameters: • 904 [SL Node Cnfg] • 905 [SL Rx CommFormat], and • 910 [SL Tx CommFormat] • Reconnect SynchLink communication fibers • Configured with parameter 384 [SL CommLoss Cnfg]
10	Drive Power Loss	• DC Bus voltage has fallen below the minimum value • Parameter 306 [DC Bus Voltage] displays bus voltage • Parameter 330 [Fault TP Data] displays the minimum value when parameter 329 [Fault TP Sel] is set to five • The drive must first complete precharge before this check is made	• Verify AC line power

No.	Name	Description	Action *(if appropriate)*
11	Motor OLoad Trip	A motor overload trip has occurred. Parameter 308 [Output Current] is squared, scaled and integrated over time. When this integrated value exceeds 1.0, this Exception Event occurs. The integrator's output can be viewed in parameter 330 [Fault TP Data] when parameter 329 [Fault TP Sel] is set to 13 “Mtr OL Outpt”. The overload integration rate is affected by parameters 336 [Motor OL Factor], 337 [Mtr I2T Curr Min], 338 [Mtr I2T Spd Min] and 339 [Mtr I2T Calibrat].	• Reduce the mechanical load • Enter the correct motor nameplate full load amps in parameter 2 [Motor NP FLA] • Configure with parameter 371 [Mtr OL Trip Cnfg]
12	Motor OLoad Pend	A motor overload is pending. Parameter 308 [Output Current] is squared, scaled and integrated over time. When this integrated value exceeds 0.5, this exception event occurs. The integrator's output can be viewed in parameter 330 [Fault TP Data] when parameter 329 [Fault TP Sel] is set to 13 “Mtr OL Outpt”. The overload integration rate is affected by parameters 336 [Motor OL Factor], 337 [Mtr I2T Curr Min], 338 [Mtr I2T Spd Min] and 339 [Mtr I2T Calibrat].	• Reduce the mechanical load • Enter the correct motor nameplate full load amps in parameter 2 [Motor NP FLA] • Configure with parameter 372 [Mtr OL Pend Cnfg]
13	Motor Stalled	The motor has stalled. These three conditions have occurred at the same time for the amount of time specified in parameter 373 [Motor Stall Time]: 1.) Drive is not stopped (parameter 150 [Logic State Mach] not equal to zero) 2.) Drive is on limit (parameter 304 [Limit Status] not equal to zero) 3.) Drive is at zero speed (parameter 155 [Logic Status] / bit 13 “At Zero Spd” is set).	• Increase torque limit • Reduce mechanical load • Configured with parameter 374 [Motor Stall Cnfg]
14	Inv OTemp Pend	Parameter 313 [Heatsink Temp] is within 10°C of the maximum value. View the maximum heat sink temperature in parameter 348 [Drive OL TP Data] when parameter 347 [Drive OL TP Sel] is set to 30 - “fMaxHsDegc”.	• Reduce the mechanical load • Lower the ambient temperature • Configured with parameter 375 [Inv OT Pend Cnfg]
15	Inv OTemp Trip	Parameter 313 [Heatsink Temp] is above the maximum limit or temperature sensor has failed (shorted or open). See parameter 346 [Drive OL Status] / bit 0 “NTC Shorted” and bit 1 “NTC Open”.	• Reduce the mechanical load • Lower the ambient temperature • Verify that the cooling fan(s) and fan inverter(s) are running and functioning properly. • Check the heatsink for blockage or excessive dirt and clear/clean as necessary. • Check the air filters (if present) for blockage and replace as necessary.

No.	Name	Description	Action *(if appropriate)*
16	Inv OLoad Pend	The drive's operating point is approaching the intermittent current rating limitation. If output current remains at or above present levels, an inverter overload condition will occur.	• Reduce the load on the drive • Configured with parameter 376 [Inv OL Pend Cnfg]
17	Inv OLoad Trip	The drive's operating point has exceeded the intermittent current rating and a foldback to the continuous rating in parameter 400 [Rated Amps] has occurred.	• Reduce the mechanical load • Configured with parameter 377 [Inv OL Trip Cnfg]
18	Ext Fault Input	A digital input has detected an external fault. Enter a value of 3 “Ext Fault” or 38 “ExtFault Inv” in one of the [Digin x Sel] parameters to configure an input to detect an external fault.	Configured with parameter 379 [Ext Flt/Alm Cnfg]
19	DSP Memory Error	Flash memory does not match the SRAM memory	• Cycle the drive power • If the fault remains, replace the Main Control Board
20	DSP Device Error	A DSP (Velocity Position Loop) interrupt task has not been completed in the allotted time.	• Cycle the drive power • If the fault remains, replace the Main Control Board
22	Over Frequency	Encoderless algorithm fails to converge on correct speed. Two possible causes: 1.) Velocity regulator is attempting to run below motor’s slip speed. 2.) Frequency regulator “pulls out” and commanded motor frequency slows to maximum frequency limit.	
23	MC Commissn Fail	The drive has failed to complete either the Motor Autotuning procedure or the Power Circuits Diagnostics test. Parameters 463 [MC Diag Error 1], 464 [MC Diag Error 2] and 465 [MC Diag Error 3] display Motor Autotuning and Power Circuit Diagnostic faults. Parameter 465 [MC Diag Error 3] - Drive current, inductance, voltage and speed are not within motor nameplate specifications. This fault occur most frequently on low horsepower motors.	• Verify that motor nameplate data is entered correctly into the drive. • Verify the motor is wired for the correction voltage entering into the drive. • Verify the encoder (if used) and velocity feedback is correct. • Change tuning mode in to parameter 515 [FVC Tune Config] to 9 “NoRotate Tune”.
24	DC Bus Overvolt	Refer to “Protection” in Appendix A in the *PowerFlex 700S Phase II Drive - User Manual*, publication 20D-UM006…, for DC Bus Overvoltage Trip levels.	• Verify the AC Line. • Verify that either the brake or bus regulator is enabled (parameter 414 [Brake/Bus Cnfg], bit 0 “Brake Enable” or bit 3 “Bus Reg Enable”, respectively). • Verify that parameter 128 [Regen Power Lim] is set properly. • If [Brake/Bus Cnfg] bit 0 “Brake Enable” is set, verify braking resistor is properly sized.
25	Inv Trans Desat	The IGBT detects a transistor failure (Desat).	

No.	Name	Description	Action *(if appropriate)*
26	Ground Fault	A current to earth exceeds 35% of the peak drive rating.	• Check the motor and external wiring to the drive output terminals for a grounded condition.
27	Inst Overcurrent	Instantaneous motor current exceeds 214% of rating	• Reduce mechanical load. • Check the motor and external wiring to the motor.
28	VPL/MC Comm Fail	A communication failure has occurred between the Velocity Position Loop (VPL) processor and the Motor Control (MC) processor on the main control board. Possible causes are: • VPL is flashing MC firmware into the MC processor when HIM indicates "Loading Config". • MC has failed to complete or pass diagnostic tests. • MC has not detected VPL handshake activity for over 32 ms. • VPL has not detected MC handshake activity for over 32 ms. This is indicated when Fault Test Point 15 or 16 equals 1. This test point is viewed in parameter 330 [Fault TP Data] when parameter 329 [Fault TP Select] is set to value 15 or 16.	• Cycle power • Reflash firmware • Replace Main Control Board
29	PWM Signal Short	This fault is detected when ever the actual IGBT gate is different than the commanded IGBT states. This fault is detected by the Motor Control (MC) processor.	
30	MC Firmware	One of the following Motor Control (MC) firmware errors has occurred: • MC Task Over Run • Illegal Interrupt • Self Diagnostic Fault • Data Error	• Cycle power • Reflash firmware • Replace Main Control Board
31	Precharge Error	The precharge function has failed to complete within 30 seconds (default) of the precharge request. The precharge time out can be configured in parameter 410 [PreChrg TimeOut]. A precharge request is initiated when the DC Bus voltage is above the Undervoltage Trip level and the precharge input is high (the requirement for the precharge being high can be bypassed by setting parameter 411 [PreChrg Control] bit 01 “PreChrg Enable” off).	• Verify the value in parameter 410 [PreChrg TimeOut]. • Verify the bit value in parameter 411 [PreChrg Control] = 1 “Enbl PrChrg”. • Configured with parameter 381 [PreChrg Err Cnfg]
32	PWM Asynch	The Motor Control Processor is not synchronized with SynchLink.	
33	+/- 15volt Power	The12V DC control voltage is outside the tolerance range. The positive voltage power must be within the band from +17.00 to +11.61V DC. The negative voltage power must be within the band from -17.00 to -11.61V DC.	• Replace switch mode power supply. For smaller frames, replace drive.

No.	Name	Description	Action *(if appropriate)*
35	Parameter Chksum	The checksum read from the EEPROM does not match the checksum calculated	• Cycle power • Replace Main Control Board
38	Brake OL Trip	The calculated temperature of the dynamic braking resistor is too high. The temperature is calculated by a thermal model. If the resistor is internal, the model uses resistor characteristic stored in the power structure EEPROM memory. If the resistor is external, the model uses values of parameters 416 [Brake PulseWatts] and 417 [Brake Watts].	• Verify actual temperature of brake: • If hot, wait for brake to cool • If cold, cycle power to the drive • If cold, verify [Brake PulseWatts] and [Brake Watts] are correct. • Configured with parameter 369 [Brake OL Cnfg]
39	PowerEE CRC Fail	The CRC of the data stored in the Power Board EEPROM does not match the stored CRC.	• Cycle power • In High Horse Power units, check communication bus lines - 10 pin connector in Main Control Board, High Horse Power interface board, and fiber optic cable connections.
40	SLink Mult Oflow	A SynchLink Multiplier Overflow has occurred. Parameter 927 [SL Mult State] displays SynchLink multiplier overflow errors.	Configured with parameter 390 [SL MultErr Cnfg]
41	Ridethru Timeout	The drive has been in a bus loss ride-through condition for more than two seconds (default). The ride-through timeout can be configured in parameter 407 [Power Loss Time].	• Verify the AC Line. • Verify the value in [Power Loss Time].

42	DC Bus Undervolt	Bus voltage has fallen below the level configured in parameter 409 [Line Undervolts].	• Verify the AC Line.
			  • In frames 1-4, and 9 - 13 verify the precharge resistor is present. (With power off, there should be a resistance between DC+ and BR+).
			  • In frames 5 & 6, check the precharge board for errors. See the precharge board LED for fault sequence.
			• Configured with parameter 393 [BusUndervoltCnfg]

43	VoltageFdbk Loss	Loss of Motor or DC Bus Voltage Feedback has occurred because of a communication failure between Motor Control and Voltage Feedback board.	• Check the communication line between Motor Control (MC) and Voltage Feedback board. • Replace the Voltage Feedback board. • Configured with parameter 394 [VoltFdbkLossCnfg]
44	Runtime Data Rst	Runtime data (hours, energy) has been reset to zero due to a checksum error.	
45	Enable Health	Safety circuit is active.	• Check input signal to the Safety circuit.
46	Interp Out Synch	Interpolator for position feedback lost synchronization with Velocity Position Loop (VPL).	Configured with parameter 378 [Interp Flt Cnfg]

No.	Name	Description	Action *(if appropriate)*
47	MC CML Task Fail	Current Minor Loop (CML) task has been delayed or run with incorrect interval.	• Cycle power.
48	No Ctrl Device	The controlling device (HIM or controller) has been disconnected while the drive was running.	• Reconnect the controlling device.
49	DPI Loss Port 1	The device at DPI port 1 has stopped communicating with the drive. A SCANport device is connected to a drive operating DPI devices at 500k Baud	• Verify DPI device is present and functional at port 1. • Configured with parameter 391 [DPI CommLoss Cfg]
50	DPI Loss Port 2	The device at DPI port 2 has stopped communicating with the drive. A SCANport device is connected to a drive operating DPI devices at 500k Baud	• Verify DPI device is present and functional at port 2. • Configured with parameter 391 [DPI CommLoss Cfg]
51	DPI Loss Port 3	The device at DPI port 3 has stopped communicating with the drive. A SCANport device is connected to a drive operating DPI devices at 500k Baud	• Verify DPI device is present and functional at port 3. • Configured with parameter 391 [DPI CommLoss Cfg]
52	DPI Loss Port 4	The device at DPI port 4 has stopped communicating with the drive. A SCANport device is connected to a drive operating DPI devices at 500k Baud	• Verify DPI device is present and functional at port 4. • Configured with parameter 391 [DPI CommLoss Cfg]
53	DPI Loss Port 5	The device at DPI port 5 has stopped communicating with the drive. A SCANport device is connected to a drive operating DPI devices at 500k Baud	• Verify DPI device is present and functional at port 5. • Configured with parameter 391 [DPI CommLoss Cfg]
54	DPI Loss Port 6	The device at DPI port 6 has stopped communicating with the drive. A SCANport device is connected to a drive operating DPI devices at 500k Baud	• Verify DPI device is present and functional at port 6. • Configured with parameter 391 [DPI CommLoss Cfg]
55	Net Loss DPI P1	A communications fault has occurred between the communication adapter at DPI port 1 and the network.	• Verify network connection. • Verify status of network. • Configured with parameter 392 [NetLoss DPI Cnfg]
56	Net Loss DPI P2	A communications fault has occurred between the communication adapter at DPI port 2 and the network.	• Verify network connection. • Verify status of network. • Configured with parameter 392 [NetLoss DPI Cnfg]
57	Net Loss DPI P3	A communications fault has occurred between the communication adapter at DPI port 3 and the network.	• Verify network connection. • Verify status of network. • Configured with parameter 392 [NetLoss DPI Cnfg]
58	Net Loss DPI P4	A communications fault has occurred between the communication adapter at DPI port 4 and the network.	• Verify network connection. • Verify status of network. • Configured with parameter 392 [NetLoss DPI Cnfg]

No.	Name	Description	Action *(if appropriate)*
59	Net Loss DPI P5	A communications fault has occurred between the communication adapter at DPI port 5 and the network.	• Verify network connection. • Verify status of network. • Configured with parameter 392 [NetLoss DPI Cnfg]
60	Net Loss DPI P6	A communications fault has occurred between the communication adapter at DPI port 6 and the network.	• Verify network connection. • Verify status of network. • Configured with parameter 392 [NetLoss DPI Cnfg]
61	Logix Out of Run	The DriveLogix controller is in a Non-Run mode. Non-Run modes include program, remote-program and faulted modes.	• Clear fault • Configured with parameter 386 [Lgx OutOfRunCnfg]
62	Logix Timeout	The communication connection to the DriveLogix controller has timed out.	Configured with parameter 387 [Lgx Timeout Cnfg]
63	Logix Closed	The DriveLogix controller has closed the Controller to Drive connection.	• Verify drive is present in I/O • Configured with parameter 388 [Lgx Closed Cnfg]
64	Logix Link Chng	A required link in the Controller to Drive Communication Format has been modified.	• Clear fault • Configured with parameter 389 [Lgx LinkChngCnfg]
65	HiHp In PhaseLs	AC Input Phase Loss - the AC input phase voltage has fallen.	1. Check for voltage on each AC input phase. 2. Check the status of each external AC input fuse. 3. Check the Rectifying board and Rectifying Modules for each AC input phase. 4. Configured with parameter 370 [HiHp InPhsLs Cfg]
66	HiHp Bus Com Dly	*(High Horse Power Only)* Bus Communication Time Delay - the communication bus has delayed feedback, or bad communication quality.	Check the communication bus lines: • 10 pin connector between the Main Control board and High Power Fiber Optic Interface board. • Fiber-optic connections between the High Power Fiber Optic Interface Circuit board and the ASIC board. • Fiber-optic connections between the High Power Fiber Optic Interface board and Voltage Feedback board
67	HiHp Bus Link Ls	Bus Communication Link Loss - bus communication between the High Power Fiber Optic Interface circuit board and the Voltage Feedback circuit board has stopped.	Check the communication bus lines: • Fiber-optic connections between the High Power Fiber Optic Interface board and Voltage Feedback board • 10 pin connector between the Main Control board and High Power Fiber Optic Interface board • Fiber-optic connections between the High Power Fiber Optic Interface Circuit board and the ASIC board

No.	Name	Description	Action *(if appropriate)*
68	HiHp Bus CRC Er	Bus Communication CRC Error - too many CRC errors have occurred in the communication bus. A fast power cycle may cause the 700S Main Control Board to attempt to communicate with the ASIC Board before the ASIC Board is energized.	Check the communication bus lines • 10 pin connector between the Main Control board and High Power Fiber Optic Interface board • Fiber-optic connections between the High Power Fiber Optic Interface board and the ASIC board • Fiber-optic connections between the High Power Fiber Optic Interface board and Voltage Feedback board
69	HiHp Bus WtchDog	Bus Communication Watchdog Error - no message (packets) came through in the communication bus - a watchdog error was detected.	Check the communication bus lines: 1. 10 pin connector between the Main Control board and High Power Fiber Optic Interface board 2. Fiber-optic connections between the High Power Fiber Optic Interface board and Voltage Feedback board 3. Replace the Voltage Feedback board 4. Replace the High Power Fiber Optic Interface board 5. Replace the ASIC board 6. Replace the Main Control board
70	HiHp Fan Fdbk Ls	Fan Feedback Loss - an inverter cooling fan did not send active feedback, or did not work.	1. Check the 10 pin connector between the Main Control board and High Power Fiber Optic Interface board 2. Check the fiber-optic connections between the High Power Fiber Optic Interface Circuit board and the ASIC board 3. Verify that the inverter cooling fans are running
71	HiHp Drv OvrLoad	Drive Overload - the drive's operating point has exceeded the intermittent current rating and a foldback to the continuous rating in parameter 400 [Rated Amps] has occurred.	1. Reduce the mechanical load. 2. If after reducing the load the output current levels are well below the drive rated levels, replace the power module.
72	HiHp PwrBd PrcEr	A processor on the High Power Fiber Optic Interface circuit board has detected a self diagnostic problem.	Check the communication bus lines: 1. 10 pin connector between the Main Control board and High Power Fiber Optic Interface board 2. Fiber-optic connections between the High Power Fiber Optic Interface board and ASIC board 3. Replace the High Power Fiber Optic Interface board

No.	Name	Description	Action *(if appropriate)*
73	HiHp PrChrg Cntc	Precharge Contactor Fault - the precharge contactor did not send back the active feedback.	On drives with DC input: • Check for loose or incorrect connections from the external precharge circuit to the X50 terminal block and to the ASIC board (X9 and X15) On drives with AC input: • Check the precharge resistors and relays on the Rectifier board
74	HiHp PwrEE Error	Power EEPROM Error - the CRC of the data stored in the High Power Fiber Optic Interface circuit board EEPROM does not match the stored CRC.	1. Cycle power. 2. Check the communication bus lines: • 10 pin connector between the Main Control board and High Power Fiber Optic Interface board • Fiber-optic connections between the High Power Fiber Optic Interface board and ASIC board 3. Replace the High Power Fiber Optic Interface board 4. Replace the ASIC board
75	HiHP PwrBd Otemp	Power Board Over Temperature - the temperature of the High Power Fiber Optic Interface circuit board has exceeded 85° C.	• Verify that the ambient temperature is within the specification. • Check the main cooling fan and fan power supply, replace if necessary • Replace the Power modules if the ambient temperature is within specification and the cooling fans are operating properly
81	+ Soft Over Trvl	*(Motion Only)* Position feedback exceeds the maximum positive travel setting, parameter 694 [Motn Mx Pos Trvl].	Configured with parameter 395 [+Sft OvrTrvlCnfg]
82	- Soft Over Trvl	*(Motion Only)* Position feedback, exceeds the maximum negative travel setting, parameter 695 [Motn Mx Neg Trvl].	Configured with parameter 396 [-Sft OvrTrvlCnfg]
83	+ Hard Over Trvl	*(Motion Only)* Signal for the hardware positive over travel appears on a digital input.	Configured with parameter 397 [+Hrd OvrTrvlCnfg]
84	- Hard Over Trvl	*(Motion Only)* Signal for the hardware negative over travel appears on a digital input.	Configured with parameter 398 [-Hrd OvrTrvlCnfg]
85	Position Error	*(Motion Only)* Parameter 769 [Position Error] exceeded parameter 696 [Motn PositErrTol].	• Verify the value in [Motn PositErrTol]. • Configured with parameter 399 [Position ErrCnfg]
86	Drive Homing	When the drive is in Drive Homing mode (parameter 740 [Position Control], bit 24 or bit 27 is On), the Drive Homing Alarm triggers and the drive moves to a home position automatically.	• Check parameter 740 [Position Control], bit14 “Find Home” or bit 27 “Return Home”.

No.	Name	Description	Action *(if appropriate)*
88	Stahl Optics	Linear Stahl Encoder detected a fault. Parameter 291 [Lin1Stahl Status] shows the details of the fault.	• Reconnect encoder or replace encoder. • Reconnect option feedback card.
93	+/- 12volt Power Alarm	The12V DC control voltage is outside the tolerance range (Alarm). The positive voltage power exceeds +15.50 V DC. The negative voltage power exceeds -15.50V DC.	• Check the power supply on the High Power Fiber Optic Interface and Voltage Feedback boards
94	Analog In 1 Loss	Analog Input channel 1 is lost. For configuration of Analog Input channel 1, see parameter 1093 [Anlg In1LossCnfg].	• Check condition of Analog Input channel 1. • Change configuration for [Anlg In1LossCnfg].
95	Analog In 2 Loss	Analog Input channel 2 is lost. For configuration of Analog Input channel 2, see parameter 1094 [Anlg In2LossCnfg].	• Check condition of Analog Input channel 2. • Change configuration for [Anlg In2LossCnfg].
96	Analog In 3 Loss	Analog Input channel 3 is lost. For configuration of Analog Input channel 3, see parameter 1095 [Anlg In3LossCnfg].	• Check condition of Analog Input channel 3. • Change configuration for [Anlg In3LossCnfg].
129	Faults Cleared	Indicates that all faults have been cleared.	*Informational only.
130	Fault Q Cleared	Indicates that the fault queue has been cleared.	*Informational only.
131	Alarm Cleared	Indicates that all alarms have been cleared.	*Informational only.
132	Alarm Q Cleared	indicates that the alarm queue has been cleared.	*Informational only.

Addressing 700H Faults

No.	Name	Description	Action *(if appropriate)*
2	Auxiliary In	The auxiliary input interlock is open.	Check all remote wiring.
3	Power Loss	The DC bus voltage remained below the value set in parameter [Power Loss Volts] for longer than the time specified in parameter [Power Loss Time]. You can enable/disable this fault with parameter 238 [Fault Config 1].	Monitor the incoming AC line for low voltage or line power interruption.
4	UnderVoltage	The DC bus voltage fell below the minimum value of 333V for 400/480V drives and 461V for 600/ 690V drives. You can enable/disable this fault with parameter 238 [Fault Config 1].	Monitor the incoming AC line for low voltage or power interruption.
5	OverVoltage	The DC bus voltage exceeded the maximum value.	Monitor the AC line for high line voltage or transient conditions. Bus overvoltage can also be caused by motor regeneration. Extend the decel time or install a dynamic brake option.
6	Motor Stall	The motor is operating at high current and low frequency and is not accelerating.	1. Run an Autotune. 2. Reduce the Load.
7	MotorOverload	Internal electronic overload trip. You can enable/disable this with parameter 238 [Fault Config 1].	1. Run an Autotune. 2. Verify the settings of parameters 48 [Motor OL Factor] and 47 [Motor OL Hertz]. 3. Reduce the load so that the drive output current does not exceed the current set by the value in parameter 42 [Motor NP FLA].
8	HeatsinkOvrTp	The heatsink temperature has exceeded the maximum allowable value. 85 degrees C = Alarm 90 degrees C = Fault	1. Verify that the maximum ambient temperature has not been exceeded. 2. Check the fan(s). 3. Check for an excess load. 4. Check the carrier frequency.
9	IGBT OverTemp	The output transistors have exceeded their maximum operating temperature due to an excessive load.	1. Verify that the maximum ambient temperature has not been exceeded. 2. Check the fan(s). 3. Check for an excess load.
10	System Fault	A hardware problem exists in the power structure.	1. Cycle the power. 2. Verify the fiber optic connections. 3. Contact Technical Support. See Technical Support Options on page 1-19 for more information. 4. If the problem persists, replace the drive.
12	OverCurrent	The drive output current has exceeded the hardware current limit.	Check programming for an excess load, improper DC boost setting, DC brake voltage set too high or other causes of excess current. Check for shorted motor leads or a shorted motor.
13	Ground Fault	A current path to earth ground exists that is greater than 25% of the drive rating. The current must appear for 800ms before the drive will fault.	Check the motor and external wiring to the drive output terminals for a grounded condition.

No.	Name	Description	Action *(if appropriate)*
14	InverterFault	A hardware problem exists in the power structure.	1. Cycle the power. 2. Contact Technical Support. See Technical Support Options on page 1-19 for more information. 3. If the problem persists, replace the drive.
15	Load Loss	Do not use this fault in 700H applications	Check that parameter 238 [Fault Config 1] / bit 0 “Power Loss” and parameter 259 [Alarm Config 1] / bit 13 “Load Loss” are set to zero.
16	Motor Therm	The option board thermistor input is greater than the limit.	1. Check to ensure that the motor is cooling properly. 2. Check for an excess load. 3. Verify the thermistor connection. If the thermistor connection on the option board is not used, it must be shorted.
17	Input Phase	One input line phase is missing. Configured in parameter 238 [Fault Config 1]	1. Check all user-supplied fuses 2. Check the AC input line voltage.
21	OutPhasMissng	There is zero current in one of the output motor phases.	1. Check the motor wiring. 2. Check the motor for an open phase.
24	Decel Inhibit	The drive cannot follow the commanded decel due to bus limiting.	1. Verify that the input voltage is within the specified limits. 2. Verify that the system ground impedance follows the proper grounding techniques. 3. Disable bus regulation and/or add a dynamic brake resistor and/or extend the deceleration time.
25	OverSpd Limit	Functions such as Slip Compensation or Bus Regulation have attempted to add an output frequency adjustment greater than the value programmed in parameter 83 [Overspeed Limit].	Remove the excessive load or overhauling conditions or increase the value in parameter 83 [Overspeed Limit].
28	BrakResMissing	No brake resistor has been detected.	1. Program parameter [Bus Reg Mode x] to not use the brake option. 2. Install a brake resistor.
29	Anlg In Loss	An analog input is configured to fault on a signal loss. A signal loss has occurred. Configure this fault with [Anlg In x Loss].	1. Check parameter settings. 2. Check for broken/loose connections at the inputs.
30	MicroWatchdog	A microprocessor watchdog timeout has occurred.	1. Cycle the power. 2. Replace the Main Control board.
31	IGBT Temp HW	The drive output current has exceeded the instantaneous current limit.	1. Check for an excess load. 2. Raise the value set in [Accel Time x]. 3. Parameter 53 [Motor Cntl Sel] may need to be set to “Custom V/Hz”. 4. Verify the values set in parameters 62 [IR Voltage Drop] and 63 [Flux Current Ref]. 5. Contact Technical Support. See Technical Support Options on page 1-19 for more information.

No.	Name	Description	Action *(if appropriate)*
32	Fan Cooling	Fan is not energized at start command.	1. Check the status LEDs on the fan inverter(s). 2. Verify that the fan(s) and fan inverter(s) are running.
33	AutoReset Lim	The drive unsuccessfully attempted to reset a fault and resumed running for the programmed number of [Flt RstRun Tries]. you can enable/ disable this fault with parameter 238 [Fault Config 1].	Correct the cause and manually clear the fault.
34	CAN Bus Flt	A sent message was not acknowledged.	1. Cycle the power. 2. Replace the Main Control board.
37	HeatsinkUndTp	The ambient temperature is too low.	Raise the ambient temperature.
44	Device Change	The new power unit or option board installed is a different type.	Clear the fault and reset the drive to the factory defaults.
45	Device Add	A new option board was added.	Clear the fault.
47	NvsReadChksum	There was an error reading parameters 9 [Elapsed MWh] and 10 [Elapsed Run Time] from EEPROM.	1. Cycle the power. 2. Replace the Main Control board.
48	ParamsDefault	The drive was commanded to write default values to EEPROM.	1. Clear the fault or cycle power to the drive. 2. Program the drive parameters as needed.
50	MotorCalcData	The motor nameplate data is incorrect.	Check the motor nameplate data and verify the proper entry in the “Motor Data” parameters.
54	Zero Divide	This event occurred because a mathematical function had a dividend of zero.	1. Cycle the power. 2. Replace the main control board.
59	Gate Disable	Both of the digital gate disable inputs (SD-1 and SD-2) are not enabled on the 20C-DG1 option board.	1. Check the motor. 2. Verify that the option board is properly wired. 3. Replace the option board. Refer to Appendix E -“Instructions for ATEX Approved PowerFlex 700H Drives in Group II Category (2) Applications with ATEX Approved Motors” in the PowerFlex 700H/S High Power Drives Installation Manual, publication PFLEX-IN006… for information on installing this option board.
60	Hrdwr Therm	The thermistor input is activated (>4kΩ) on the 20C-DG1 option board.	1. Check the motor. 2. The resistance of the thermistor input must go below 2kΩ before the drive can be reset.
63	Shear Pin	The value programmed in parameter 148 [Current Lmt Val] has been exceeded. You can enable/disable this fault with parameter 238 [Fault Config 1].	Check the load requirements and the value in [Current Lmt Val].
65	I/O Removed	An I/O option board has been removed.	Clear the fault.
70	Power Unit	One or more of the output transistors were operating in the active region instead of desaturation. This can be caused by excessive transistor current or insufficient base drive voltage.	Clear the fault.

No.	Name	Description	Action *(if appropriate)*
71	Periph Loss	The communications card has a fault on the network side.	1. Check the DPI device event queue and corresponding fault information for the device.
81	Port DPI Loss	The DPI port has stopped communicating. A SCANport device was connected to a drive operating DPI devices at 500k baud.	1. If the adapter was not intentionally disconnected, check the wiring to the port. Replace the wiring, port expander, adapters, Main control board or complete drive as required. 2. Check the HIM connection. 3. If an adapter was intentionally disconnected and the bit for that adapter in parameter 276 [Logic Mask] is set to "1", this fault will occur. To disable this fault, set the [Logic Mask] bit for the adapter to "0."
95	AutoT Rs Stat	The Autotune Rs Static Test has failed.	1. Verify that the motor is not rotating when autotune is enabled. 2. Check the motor connections.
96	AutoT Lm Rot	The Autotune Lm rotate test has failed.	1. Check the motor nameplate data. 2. Check the motor connections. 3. Verify that the Accel Time < (Base Speed/40) x 33 sec. Note: 33 sec. = time limit to bring motor to 40 Hz.
97	AutoT MagRot	The Autotune magnetizing current rotate test has failed.	1. Check the motor nameplate data. 2. Check the motor connections. 3. Verify that the Accel Time < (Base Speed/40) x 33 sec. (see above).
98	AutoT Saturat	The Autotune saturation curve test has failed.	1. Check the motor nameplate data. 2. Check the motor connections.
99	UserSet Timer	A User Set load or save was not completed in less than 5 seconds.	Replace the Main Control board.
100	Param Chksum	The checksum read from the Main Control board does not match the checksum calculated.	1. Restore the drive to the factory defaults. 2. Cycle the power. 3. Reload User Set if used.
104	PwrBrd Chksum	The checksum read from the EEPROM does not match the checksum calculated from the EEPROM data.	1. Cycle the power. 2. Contact Technical Support. See Technical Support Options on page 1-19 for more information. 3. If the problem persists, replace the drive.
106	MCB-PB Config	The drive rating information stored on the power board is incompatible with the Main Control board.	1. Reset the fault or cycle the power. 2. Replace the Main Control board.
107	New IO Option	A New option board was added to the Main Control board.	1. Restore the drive to the factory defaults. 2. Reprogram parameters as necessary.
113	Fatal App	A Fatal Application error has occurred.	1. Replace the Main Control board.

No.	Name	Description	Action *(if appropriate)*
114	AutoT Enable	Autotune is enabled but has not started.	Press the Start key within 20 seconds of enabling autotune.
120	I/O Change	An option board has been replaced.	Reset the fault.
121	I/O Comm Loss	An I/O Board lost communications with the Main Control board.	1. Check the connector. 2. Check for induced noise. 3. Replace I/O board or Main Control board.

Common Drive Conditions and Corrective Actions

No Output Voltage

The drive has no output voltage to the motor, even though the drive indicates that the motor is running.

Diagnostic Procedure	Corrective Action
1. Measure the DC bus voltage.	If the DC bus is not within specification, repair or replace the Rectifying module as needed. Otherwise, continue with step 2.
2. Measure the AC output voltage at the motor terminals using a VAC RMS meter and compare the measurement to the AC output voltage displayed on the HIM (Par 307 [Output Voltage] for 700S drives, Par 6 [Output Voltage] for 700H drives).	If the AC output voltage at the motor terminals does not match the output voltage displayed on the HIM, repair or replace the Output Power modules as needed. Otherwise, continue with step 3.
3. Verify that there are no loose or missing connections between the Gate Driver board and ASIC board and the Gate Driver board and Adapter board.	If there are loose or missing connections, or a board has been damaged, replace the loose or missing connections, or repair or replace any of the boards as needed. Otherwise, continue with step 4.

ATTENTION: The sheet metal cover and mounting screws on the ASIC board located on the power structure are energized at (-) DC bus potential high voltage. Risk of electrical shock, injury, or death exists if someone comes into contact with the assembly.

4. Complete the "Conducting Forward and Reverse Biased Diode Tests for Major Power Components" on page 2-3 for the Output Power modules.	If the test is not completed successfully, replace the Output Power modules. Otherwise, continue with step 5.
5. Check the motor windings and motor cables with a high resistance DVM (megger).	Repair or replace the motor as needed.

Blown Input Fuse

If the drive causes the AC input line fuse to open, complete the following tests to verify that the power structure is functioning properly before replacing the AC input line fuse and reapplying power to the drive.

Diagnostic Procedure	Corrective Action
1. Disconnect the motor leads.	Continue with step 2.
2. Complete the "Conducting Forward and Reverse Biased Diode Tests for Major Power Components" on page 2-3 for the Rectifier module.	If the test is not completed successfully, replace the Rectifying module. Continue with step 3.
3. Complete the "Conducting Forward and Reverse Biased Diode Tests for Major Power Components" on page 2-3 for the Output Power modules.	If the test is not completed successfully, replace the Output Power modules. Continue with step 4.
4. Examine the DC bus capacitors.	If there is evidence of charring and damaged reliefs, replace the DC bus capacitors. Otherwise, continue with step 5.
5. Check the motor windings and motor cables with a high resistance DVM (megger).	Repair or replace the motor as needed. Otherwise, continue with step 6.
6. Disconnect and check the AC choke with a high resistance DVM (megger). • Verify that the line to line is open • Verify that the line to ground is open • Verify that the input to output is low resistance, but not shorted	Repair or replace the AC choke as needed. Continue with step 7.
7. Reconnect the AC choke and motor leads.	

No HIM Display

If the HIM does not display, complete the following procedure to verify that power is available.

Diagnostic Procedure	Corrective Action
1. Measure the DC bus voltage.	If the DC bus is not within specification, repair or replace the Rectifying module as needed. Otherwise, continue with step 2.
2. Measure the DC voltage supply at connector X4 on the DPI circuit board on the back of the HIM cradle. The voltage should be approximately 12V DC.	If the DC voltage is incorrect: • PowerFlex 700S drives - Replace the High Power Fiber Optic Interface circuit board • PowerFlex 700H drives - Replace the output power modules Otherwise, continue with step 3.
3. Check for loose or missing connections between the DPI circuit board and the High Power Fiber Optic Interface circuit board.	If there are loose or missing connections, or a board has been damaged, replace the loose or missing connections, or repair or replace any of the boards as needed. Otherwise, Replace the HIM.

Technical Support Options

Technical Support Wizards

If you are connected to a drive via DriveExplorer™ or DriveExecutive™, you can run a Tech Support wizard to gather information that will help diagnose problems with your drive and/or peripheral device. The information gathered by the wizard is saved as a text file and can be emailed to your remote technical support contact. (See What You Need When You Call Tech Support on page 1-20 for more information.)

To run a Tech Support wizard in DriveExplorer, select **Wizards** from the **Actions** menu. In DriveExecutive, select **Wizards** from the **Tools** menu. Or, click the  button. Follow the prompts to complete the wizard.

What You Need When You Call Tech Support

When you contact Technical Support, please be prepared to provide the following information:

- Order number
- Product catalog number and drives series number (if applicable)
- Product serial number
- Firmware revision level
- Most recent fault code
- Your application

The data contained in the following parameters will help in initial troubleshooting of a faulted PowerFlex 700H drive. You can use the table below to record the data provided in each parameter listed.

Param(s)	Name	Description	Parameter Data
224	Fault Frequency	Captures and displays the output speed of drive at time of last fault.	
225	Fault Amps	Captures and displays motor amps at time of last fault.	
226	Fault Bus Volts	Captures and displays the DC bus voltage of drive at time of last fault.	
227	Status 1 @ Fault	Captures and displays [Drive Status 1] bit pattern at time of last fault.	
228	Status 2 @ Fault	Captures and displays [Drive Status 2] bit pattern at time of last fault.	
229	Alarm 1 @ Fault	Captures and displays [Drive Alarm 1] bit pattern at time of last fault.	
230	Alarm 2 @ Fault	Captures and displays [Drive Alarm 2] bit pattern at time of last fault.	
243	Fault 1 Code	A code that represents the fault that tripped the drive.	
245	Fault 2 Code		
247	Fault 3 Code		
249	Fault 4 Code		
251	Fault 5 Code		
253	Fault 6 Code		
255	Fault 7 Code		
257	Fault 8 Code		
244	Fault 1 Time	Time stamp of the fault occurrence.	
246	Fault 2 Time		
248	Fault 3 Time		
250	Fault 4 Time		
252	Fault 5 Time		
254	Fault 6 Time		
256	Fault 7 Time		
258	Fault 8 Time		
262-269	Alarm Code 1-8	A code that represents a drive alarm. No time stamp available.	

Component Test Procedures

ATTENTION: To avoid an electric shock hazard, ensure that all power to the drive has been removed before performing the following.

ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged completely before servicing. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC and -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all three measurements.

ATTENTION: The sheet metal cover and mounting screws on the ASIC Board located on the power structure are energized at (-) DC bus potential high voltage. Risk of electrical shock, injury, or death exists if someone comes into contact with the assembly.

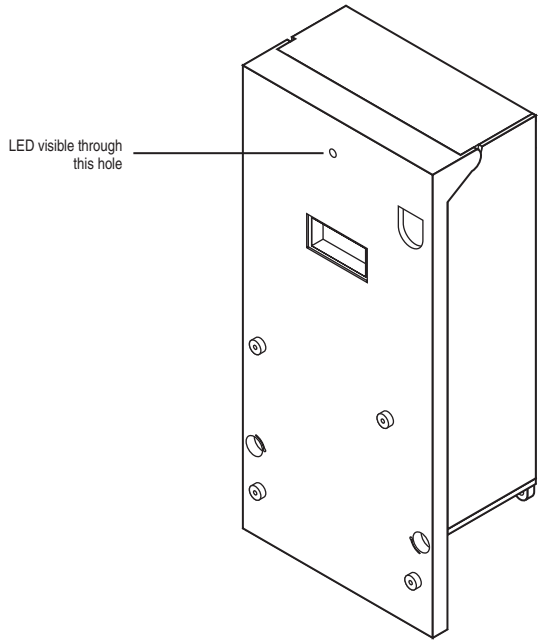
ATTENTION: HOT surfaces can cause severe burns. **Do not** touch the heatsink surface during operation of the drive. After disconnecting power allow time for cooling.

ATTENTION: This drive contains **ESD** (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference A-B publication 8000-4.5.2, “Guarding Against Electrostatic Damage” or any other applicable ESD protection handbook.

Viewing the 700H Diagnostic LED

The Control Assembly on 700H drives contains a diagnostic LED which is visible through the cover of the Control Assembly.

ATTENTION: The Control Assembly LED is only operational when the drive is energized, and only visible with the covers removed from the power structure. Servicing energized equipment can be hazardous. Severe injury or death can result from electrical shock, burn or unintended actuation of controlled equipment. Follow Safety related practices of NFPA 70E, *ELECTRICAL SAFETY FOR EMPLOYEE WORKPLACES*. DO NOT work alone on energized equipment!



LED	Indication
Steady	The drive is operational and has no faults
Flashing Quickly	• Switching power supply overload • Rectifier Board fault • Fan or fan inverter fault • Brake Chopper fault • Fiber Optic Adapter Board Fault
Flashing Slowly	Bad connection between circuit boards, check all connections

Performing Visual Inspections

Visually inspect the cooling tunnels and power structure before energizing the drive.

Inspecting the Cooling Tunnels

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Remove the main cooling fans from the bottom of the power structure. Refer to Removing the Main Fans on page 3-28.
3. Inspect the tunnels. Clean the heatsinks and tunnels if necessary.

Inspecting the Power Structure

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Covers from the Power Structure on page 3-15.
3. Check components for burn marks, breakage or foil delamination on circuit boards. Check all the boards on the power structure, including those on the Output Power Modules and the Rectifying Module (if present).

   Replace any of these components without further testing if they show evidence of burn marks, breakage or foil delamination.

Conducting Forward and Reverse Biased Diode Tests for Major Power Components

A forward biased diode test checks the semiconductor junctions between the terminals and measures the voltage drop across those junctions. A reverse biased diode test should find an open circuit, and the meter should display a value close to zero (Ex. ".0L" = zero load).

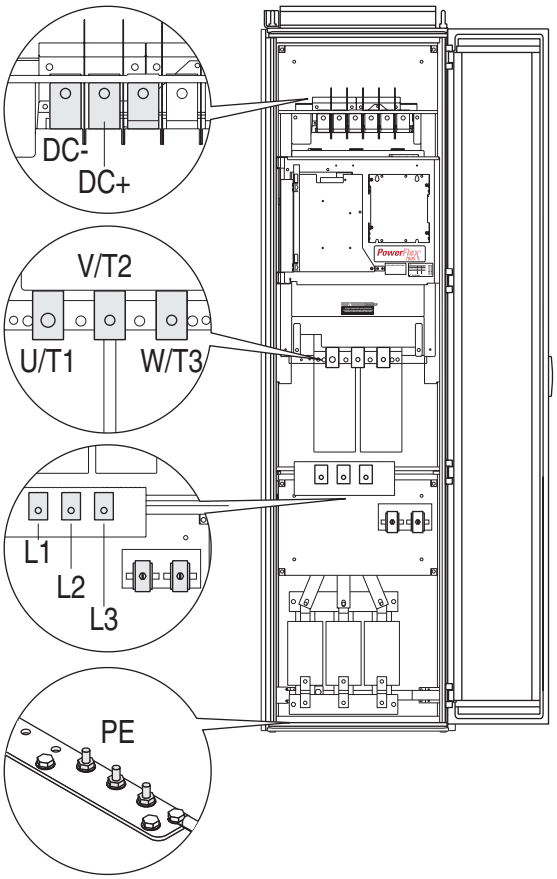
Important: The actual voltage readings may vary depending upon your equipment. If your readings are not near the indicated values in the tables below, verify that the actual voltage measured is consistent for the Rectifying module and Output Power modules.

There is a series A and series B Rectifying circuit board. The tests you can perform and the results of those tests vary depending on which series of board is in your drive.

	Rectifying Circuit Board Catalog String	
Voltage Class	**Series A**	**Series B**
400/480V AC	20-VB00459	20-VB00461
600/690V AC	20-VB00460	20-VB00462

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Covers from the Power Structure on page 3-15.
3. Disconnect the motor leads from the drive.
4. Conduct forward and reverse biased diode tests on the Rectifying Module (if present) and the Output Power Modules.

Figure 2.1 Measurement Points for Forward and Reverse Diode Tests



Series A Rectifying Circuit Board - Rectifying Module Tests

Table 2.A Forward Biased Diode Tests on Rectifying Module

Meter Leads		
-	+	Nominal meter reading
DC+	L1	The value should gradually rise to about 0.5V(1)
DC+	L2	
DC+	L3	
L1	DC-	
L2	DC-	
L3	DC-	

(1) The actual voltage reading may vary depending upon your equipment. If your readings are not near 0.5V, verify that the actual voltage measured is consistent for the Rectifying module and the Output Power modules.

Table 2.B Reverse Biased Diode Tests on Rectifying Module

Meter Leads		
+	-	Nominal meter reading
L1	DC-	Meter should display ".0L" (zero load).
L2	DC-	
L3	DC-	
DC+	L1	
DC+	L2	
DC+	L3	

Series B Rectifying Circuit Board - Rectifying Module Tests

Table 2.C Forward Biased Diode Tests on Rectifying Module

Meter Leads		
-	+	Nominal meter reading
DC+	L1	The value should gradually rise to about 1.0V(1)
DC+	L2	
DC+	L3	
L1	DC-	The value should gradually rise to about 0.35V(2)
L2	DC-	
L3	DC-	

(1) The actual voltage reading may vary depending upon your equipment. If your readings are not near 1.0V, verify that the actual voltage measured is consistent for the Rectifying module and the Output Power modules.

(2) The actual voltage reading may vary depending upon your equipment. If your readings are not near 0.35V, verify that the actual voltage measured is consistent for the Rectifying module and the Output Power modules.

Table 2.D Reverse Biased Diode Tests on Rectifying Module

Meter Leads		
+	-	Nominal meter reading
L1	DC-	Meter should display ".0L" (zero load) and rises to the meter battery voltage.
L2	DC-	
L3	DC-	
DC+	L1	
DC+	L2	
DC+	L3	

Important: If the drive fails any of these measurements, replace the Rectifying Module.

Series A Rectifying Circuit Board - Output Power Module Tests

Table 2.E Forward Biased Diode Tests on Output Power Modules

Meter Leads		
+	-	Nominal meter reading
DC-	T1	The value should gradually rise to about 0.5V(1)
DC-	T2	
DC-	T3	
T1	DC+	
T2	DC+	
T3	DC+	

(1) The actual voltage reading may vary depending upon your equipment. If your readings are not near 0.5V, verify that the actual voltage measured is consistent for the Rectifying module and the Output Power modules.

Table 2.F Reverse Biased Diode Tests on Output Power Modules

Meter Leads		
+	-	Nominal meter reading
T1	DC-	Meter should display ".0L" (zero load)
T2	DC-	
T3	DC-	
DC+	T1	
DC+	T2	
DC+	T3	

Series B Rectifying Circuit Board - Output Power Module Tests

Table 2.G Forward Biased Diode Tests on Output Power Modules

Meter Leads		
+	-	Nominal meter reading
DC-	T1	The value should gradually rise to about 1.0V(1)
DC-	T2	
DC-	T3	
T1	DC+	The value should gradually rise to about 0.35V(2)
T2	DC+	
T3	DC+	

(1) The actual voltage reading may vary depending upon your equipment. If your readings are not near 1.0V, verify that the actual voltage measured is consistent for the Rectifying module and the Output Power modules.

(2) The actual voltage reading may vary depending upon your equipment. If your readings are not near 0.35V, verify that the actual voltage measured is consistent for the Rectifying module and the Output Power modules.

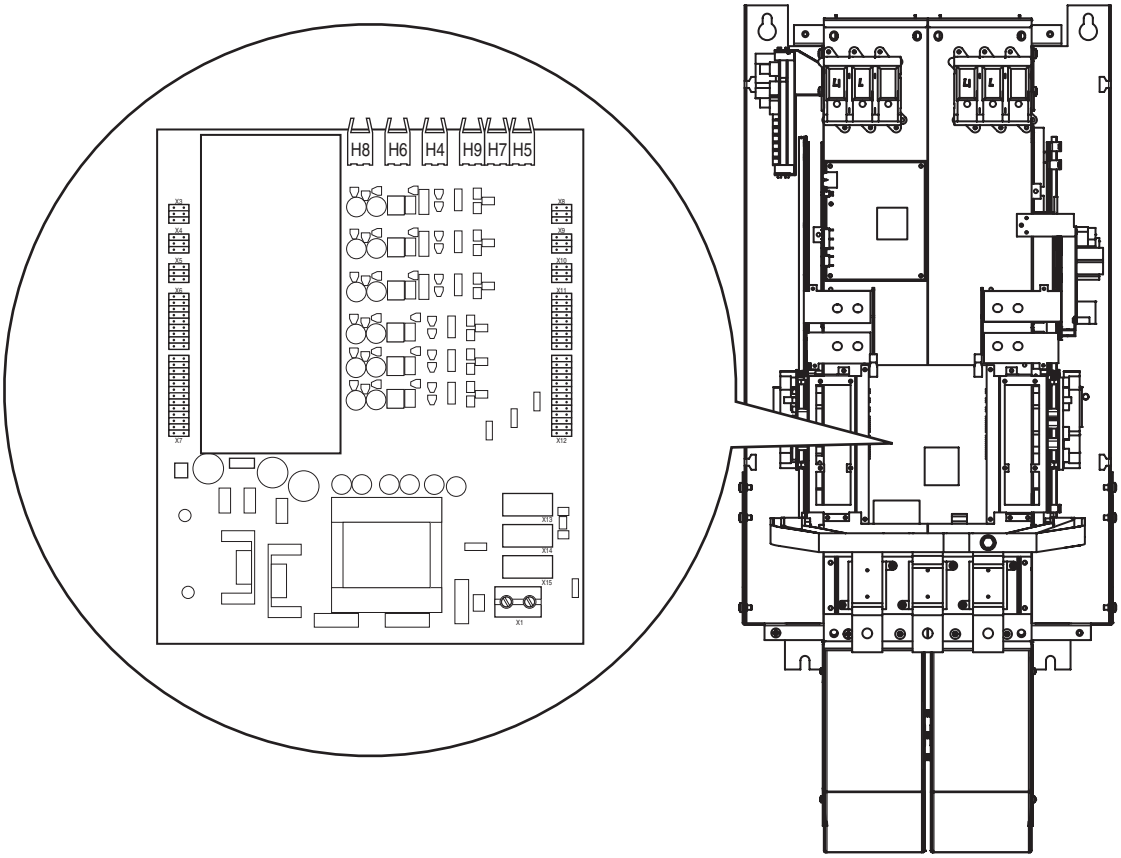
Table 2.H Reverse Biased Diode Tests on Output Power Modules

Meter Leads		
+	-	Nominal meter reading
T1	DC-	Meter should display ".0L" (zero load) and rises to the meter battery voltage.
T2	DC-	
T3	DC-	
DC+	T1	
DC+	T2	
DC+	T3	

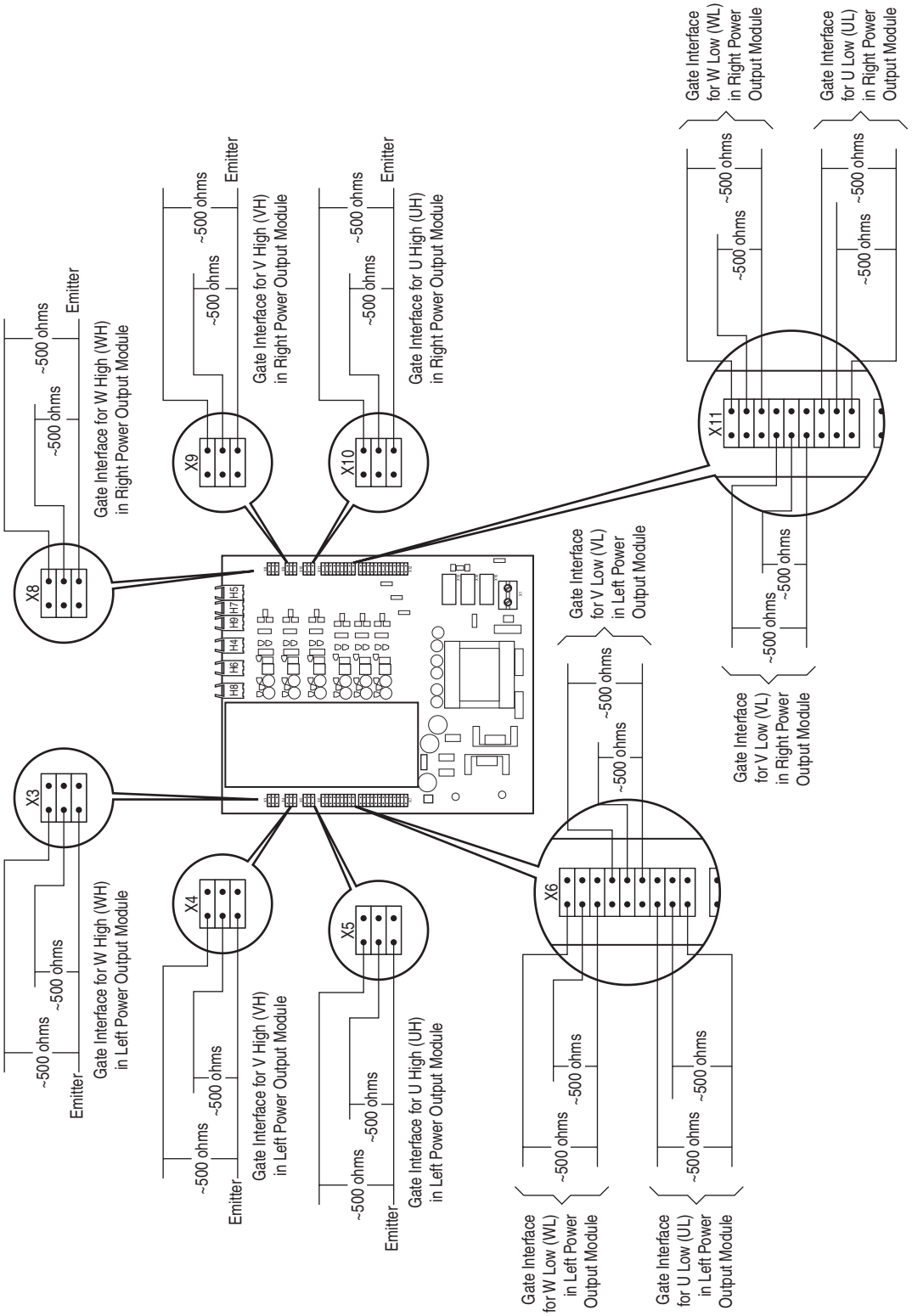
If the drive fails any of these measurements, replace both Output Power Modules.

Conducting Gate Driver Board Gate Interface Resistance Measurements

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Covers from the Power Structure on page 3-15.
3. Locate the Gate Driver Board on the front of the power structure.



4. Measure the gate interface resistance for each output power transistor. The resistance from each gate and collector pin to the branch emitter pin should be about 500 ohms. If any of the gate interfaces fails this test, replace both Output Power modules.



Checking the Rectifying Module (on AC Input Drives Only)

Important: This procedure requires special equipment and training. Only qualified and trained personnel should perform these procedures.

There is a series A and series B Rectifying circuit board. The tests you can perform and the results of those tests vary depending on which series of board is in your drive.

	Rectifying Circuit Board Catalog String	
Voltage Class	Series A	Series B
400/480V AC	20-VB00459	20-VB00461
600/690V AC	20-VB00460	20-VB00462

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Covers from the Power Structure on page 3-15.
3. Remove the Power Structure from the enclosure. Refer to Removing the Power Structure from the Drive Enclosure on page 3-27.
4. Visually inspect the pre-charging resistors. If the pre-charging resistors are damaged:

   A. Replace the Rectifying Module (Refer to Removing the Right-Side Output Power Module and Rectifying Module on page 3-36).

   B. Check the rectifiers and external connections for short-circuits.

   C. Check the Output Power Modules (Refer to Conducting Forward and Reverse Biased Diode Tests for Major Power Components on page 2-3).

5. Verify that the plugs on the cable that connects X13 on the Rectifying Board to X2 on the ASIC Board are properly seated.
6. Verify that the jumper at X50 on the Rectifying board is in place.

Taking Measurements on Rectifying Module

7. Disconnect connectors X13, X12, X11 and X10.
8. Perform resistance measurements, using a digital multimeter, on the points listed in Table 2.I on page 2-10 or Table 2.J on page 2-10 (on AC Three-Phase drives). These points are on the back of the X10, X11 and X12 plugs which you have disconnected from the board. **If the Rectifying Module fails any of these tests, replace it** (Refer to Removing the Right-Side Output Power Module and Rectifying Module on page 3-36)**.**

Table 2.I Series A Rectifying Circuit Board Resistance Measurements

Measurement points	Resistance
X10: red to X10: black	$18\Omega \pm 1\Omega$
X11: red to X11: black	
X12: red to X12: black	

Table 2.J Series B Rectifying Circuit Board Resistance Measurements

Measurement points	Resistance
X10: red to X10: black	$47\Omega \pm 4.7\Omega$
X11: red to X11: black	
X12: red to X12: black	

Drives with Series A Rectifying Circuit Boards Only

9. Without applying power to X13, verify that there is no resistance between the following points: J3 and X9, J7 and X9, and J11 and X9. Refer to Rectifying Board Charge Relay Test Results on page 2-11. **If the Rectifying Module fails any of these tests, replace it** (Refer to Removing the Right-Side Output Power Module and Rectifying Module on page 3-36)**.**

Figure 2.2 Rectifying Board Layout and Measurement Points

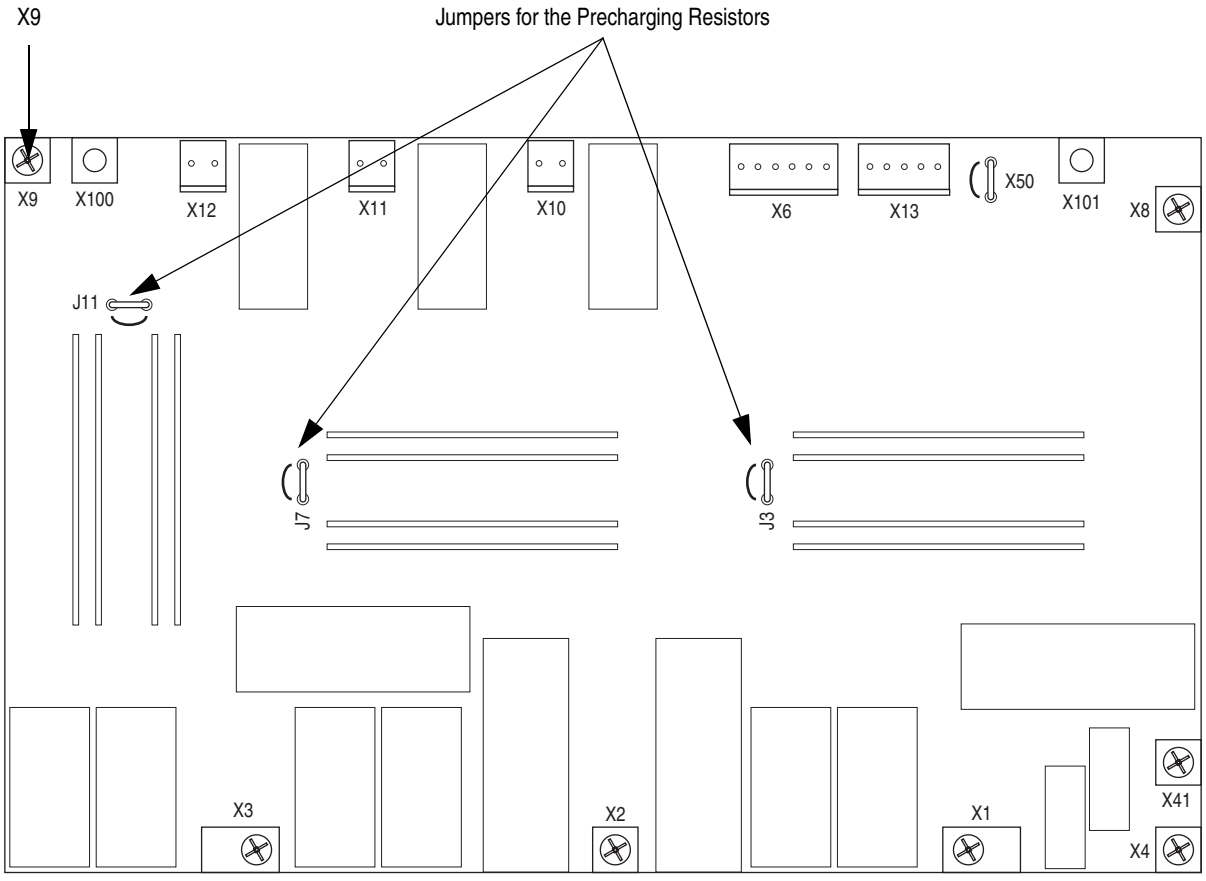


Table 2.K Rectifying Board Charge Relay Test Results

No Power on X13		
Meter Leads		Results
+	-	
J3	X9	0Ω
J7	X9	
J11	X9	

Checking the Fan Inverters and Main Fans

Checking the Fan Inverter LEDs

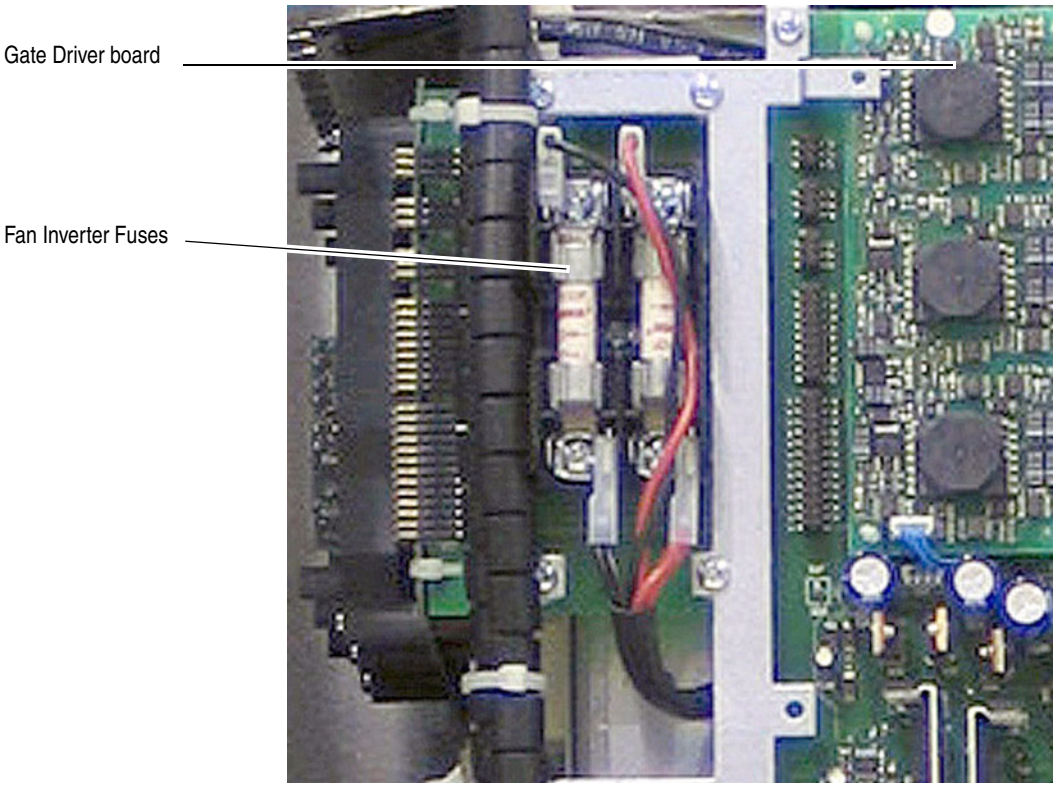
A frame 10 drive has two fans and two fan inverters. Each fan inverter has a red and a green diagnostic LED.

ATTENTION: The inverter LEDs are only operational when the drive is energized, and only visible with the covers removed from the power structure. Servicing energized equipment can be hazardous. Severe injury or death can result from electrical shock, burn or unintended actuation of controlled equipment. Follow Safety related practices of NFPA 70E, *ELECTRICAL SAFETY FOR EMPLOYEE WORKPLACES*. DO NOT work alone on energized equipment!

LED		
Red	**Green**	**Indication**
Steady	Steady	Inverter Idle
Off	Flashing	Inverter Running
Flashing	Steady	Inverter Faulted or No Control from ASIC Board

Checking the Fan Inverter Fuses

A pair of fuses (F1 and F2) are included in the circuit to feed DC Bus power to the fan inverters. The fuses are located on the left front of the drive next to the Gate Driver board. Locate these fuses and, using a multi-meter, verify that they are not open.



Isolating a Faulty Fan Inverter

The ASIC Board controls both fan inverters. A cable connects X11 on the ASIC Board to X8 on the left-hand inverter. Another cable connects X3 of the left-hand inverter to X8 on the right-hand inverter. A jumper terminates X3 on the right-hand inverter. Refer to Figure B.6 on page B-7. Use the following procedure to isolate a faulty inverter if the fans are not running:

1. Disconnect the cable from X3 of the left-hand inverter.
2. Remove the jumper from X3 of the right-hand inverter, and connect it to X3 of the left-hand inverter.
3. Energize the drive. If the left-hand fan runs, then the right-hand fan inverter is faulty.

Checking the Main Fan Motors

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Covers from the Power Structure on page 3-15.
3. Disconnect the left-hand fan motor from its inverter.
4. Measure the resistance of the fan windings. If the resulting measurements are not similar to those in Table 2.L below, replace the fan (Refer to Removing the Main Fans on page 3-28).

Table 2.L Correct Fan Measurements

Connection Wires	Resistance ± 5%
Black-Brown	60
Brown-Blue	26
Blue-Black	34
Resistance to ground	.0L (Zero Load)

5. Reconnect the left-hand fan motor to its inverter.
6. Repeat steps 3-5 for the right-hand fan motor.

Access Procedures

ATTENTION: To avoid an electric shock hazard, ensure that all power to the drive has been removed before performing the following.

ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged completely before servicing. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC and -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all three measurements.

ATTENTION: The sheet metal cover and mounting screws on the ASIC Board located on the power structure are energized at (-) DC bus potential high voltage. Risk of electrical shock, injury, or death exists if someone comes into contact with the assembly.

ATTENTION: HOT surfaces can cause severe burns. **Do not** touch the heatsink surface during operation of the drive. After disconnecting power allow time for cooling.

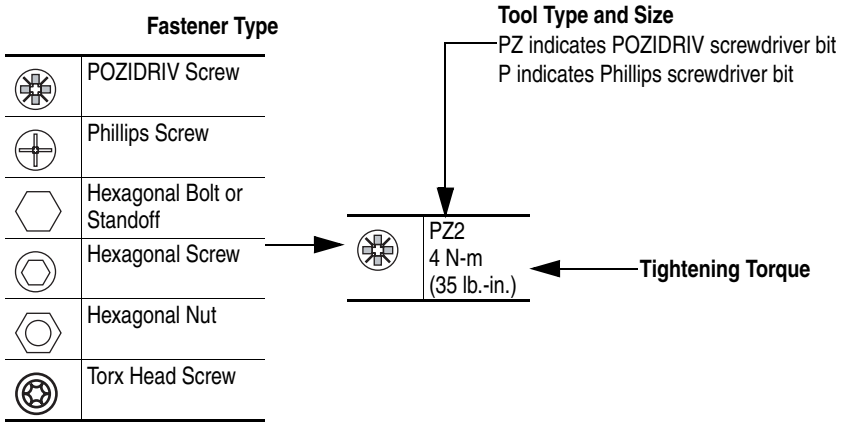
ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into fiber-optic ports or fiber-optic cable connectors.

ATTENTION: This drive contains **ESD** (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference A-B publication 8000-4.5.2, “Guarding Against Electrostatic Damage” or any other applicable ESD protection handbook.

Torque Specifications

Understanding Torque Figures in Assembly Diagrams

Icons and numbers in the assembly diagrams indicate how to tighten hardware:



The following table lists fastener torque specifications:

Item	Fastener	Final Torque
700H Fiber Optic Adapter Board (mounting)	M4 x 8 POZIDRIV®	0.9 N-m (8 lb.-in.)
700H I/O and Control Assembly	M4X8 self-tapping	0.8 N-m (7 lb.-in.)
700S Power Interface Circuit Board (mounting)	M3 x 6 Phillips®	0.9 N-m (8 lb.-in.)
700S Voltage Feedback Circuit Board (mounting)	M3 x 6 Phillips	0.9 N-m (8 lb.-in.)
700S Voltage Feedback Circuit Board (mounting)	M3 x 0.5 thread - 37 mm x 37 mm hex standoff	0.9 N-m (8 lb.-in.)
AC Input Terminals on Power Structure	M10 nut	40 N-m (354 lb.-in.)
ASIC Fan	M4 x 16 POZIDRIV	0.4 N-m (3.5 lb.-in.)
Block (Mounting)	M10 x 12 hexagonal screw	20 N-m (177 lb.-in.)
Capacitor	M4 x 8 self tapping	1 N-m (9 lb.-in.)
Capacitor Bus Bar	M6 x 16 POZIDRIV	4 N-m (35 lb.-in.)
Capacitor Bus Bar	M6 x 20 POZIDRIV	4 N-m (35 lb.-in.)
DC- / DC+ Terminals	M6 x 20 POZIDRIV	5 N-m (44 lb.-in.)
DPI / HIM Assembly (mounting)	M3 x 6 Phillips	0.9 N-m (8 lb.-in.)
DPI / HIM Assembly Door	M3 x 6 Phillips	0.9 N-m (8 lb.-in.)
Main Fan	M4 x 8 POZIDRIV	1.7 N-m (15 lb.-in.)
Main Fan (Mounting)	M6 x 20 POZIDRIV	3 N-m (27 lb.-in.)
Main Fan Inverter Assembly	M5 x 10 POZIDRIV	4 N-m (35 lb.-in.)
Motor Output Terminals on Power Structure	M8 x 20 hexagonal screw	20 N-m (177 lb.-in.)
Output Power Module Output Terminals (U,V,W)	M8 x 20 hexagonal screw	14 N-m (124 lb.-in.)
Rectifier board (Mounting)	M4 x 8 POZIDRIV	1 N-m (9 lb.-in.)
Rectifying Module Input Terminals (L1,L2,L3)	M10 x 20 hexagonal screw	12 N-m (106 lb.-in.)
Touch Cover (Main Fan)	M5 x 16	3 N-m (27 lb.-in.)
Y-Bus Bar	M10 nut	40 N-m (354 lb.-in.)

Removing Power from Drive

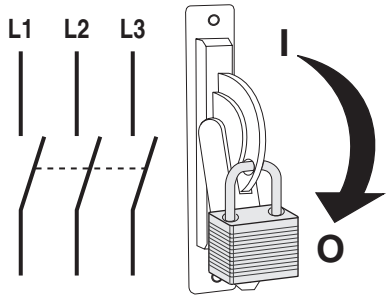
ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged completely before servicing. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC and -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all three measurements.

Remove power before making or breaking cable connections. When you remove or insert a cable connector with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system's field devices, causing unintended machine motion
- causing an explosion in a hazardous environment

Electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance.

1. Turn off and lock out input power. Wait five minutes.
2. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC and -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all three measurements.

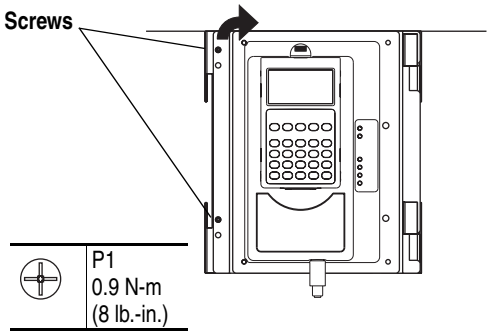


Removing the DPI / HIM Assembly

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.

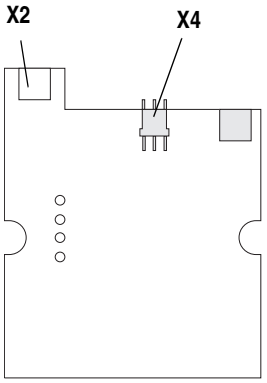
Important: Before removing connections and wires, mark the connections and wires to avoid incorrect wiring during assembly.

2. Remove the two screws from front of DPI / HIM assembly.



3. Open the panel that holds the DPI interface and HIM.

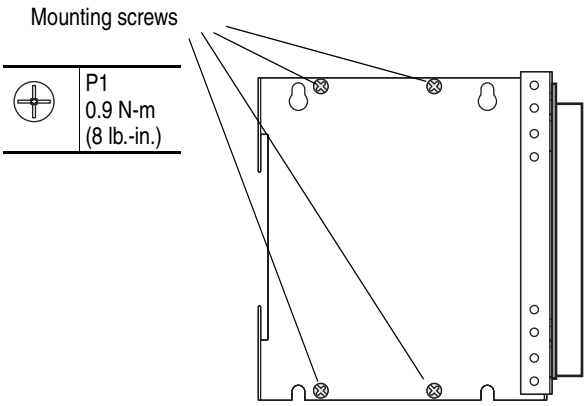
4. Unplug the DPI cable from the X2 connector on the DPI Interface circuit board.



Back view of DPI circuit board, which should remain mounted on the back of the assembly.

5. On 700S drives only, unplug the cable from the X4 connector on the DPI circuit board.

6. Remove the four mounting screws and the assembly from the Control Frame.



Installing the DPI / HIM Assembly

Install the DPI / HIM assembly in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the 700S Phase I Control Assembly

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.

Important: Before removing connections and wires, mark the connections and wires to avoid incorrect wiring during assembly.

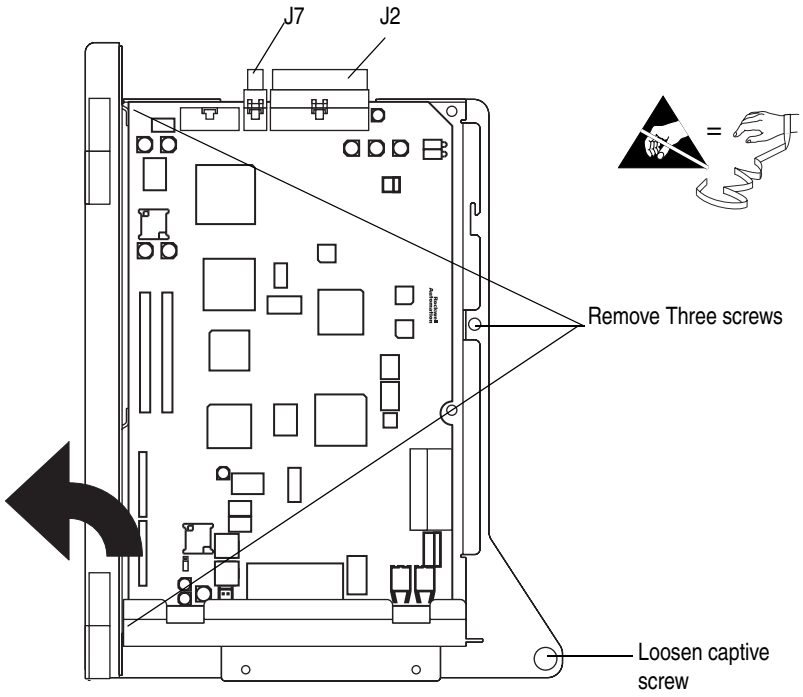
ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into fiber-optic ports or fiber-optic cable connectors.

Important: Minimum inside bend radius for SynchLink fiber-optic cable is 25.4 mm (1 in.). Any bends with a shorter inside radius can permanently damage the fiber-optic cable. Signal attenuation increases with decreased inside bend radii.

1. Loosen the captive screw and swing the Control assembly away from drive.
2. On the Control assembly:
   - Unplug the I/O and SynchLink cables from the Main Control circuit board
   - Unplug the feedback wiring from Feedback Option card
   - Unplug communication cables from DriveLogix™ controller (if present)
3. Unplug the ribbon cables from J2 and J7 on the Main Control circuit board.

Note: If the DriveLogix option is installed, the J2 and J7 connections for the ribbon cables will be located behind the DriveLogix controller.

4. Remove the three screws that hold the control bracket and Phase I Main Control circuit board to the control frame.



5. Remove the control bracket and Phase I Main Control circuit board.

Installing the 700S Phase I Control Assembly

Install the 700S Phase I Control assembly in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the 700S Phase II Control Assembly

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.

Important: Before removing connections and wires, mark the connections and wires to avoid incorrect wiring during assembly.

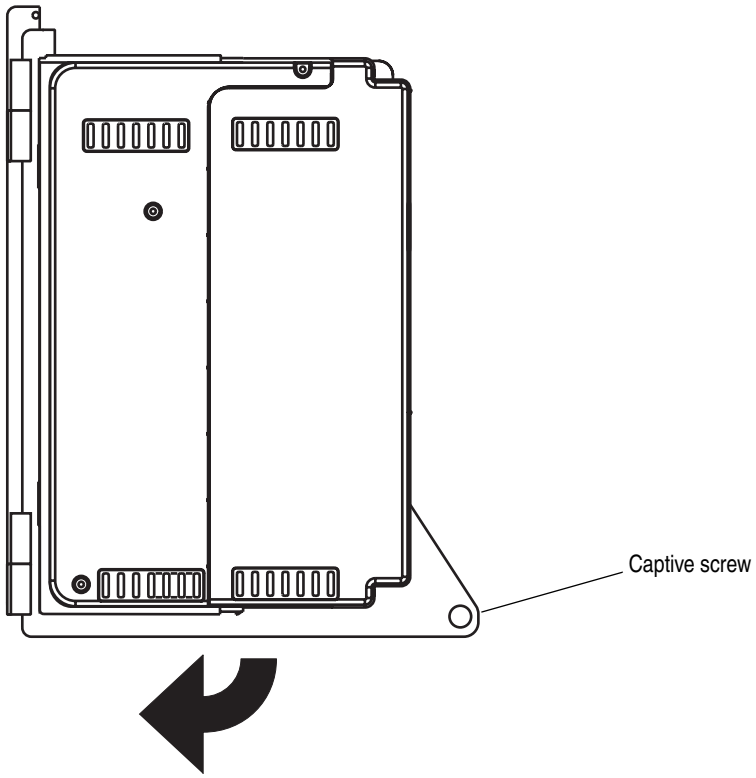
2. Unplug any fiber optic ControlNet and SynchLink cables from the Control Assembly (if present).

ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into fiber-optic ports or fiber-optic cable connectors.

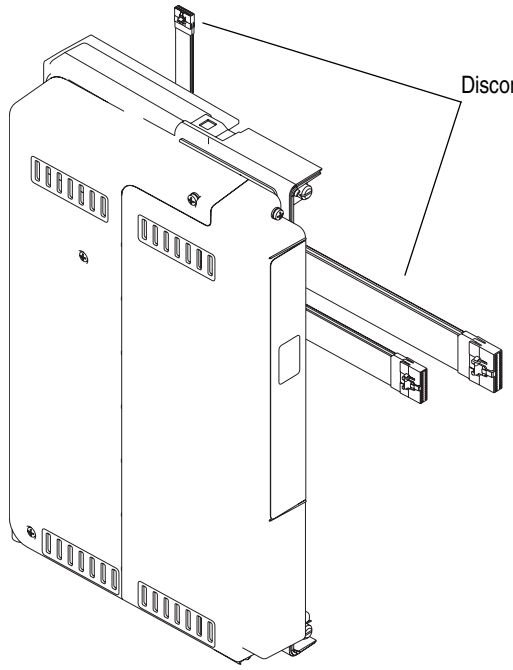
Important: Minimum inside bend radius for SynchLink and ControlNet fiber-optic cable is 25.4 mm (1 in.). Any bends with a shorter inside radius can permanently damage the fiber-optic cable. Signal attenuation increases with decreased inside bend radii.

3. Unplug any remaining I/O and communications cables from the Control assembly and set them aside.

4. Loosen the captive screw on the Control assembly mounting plate and swing the Control assembly away from the drive.

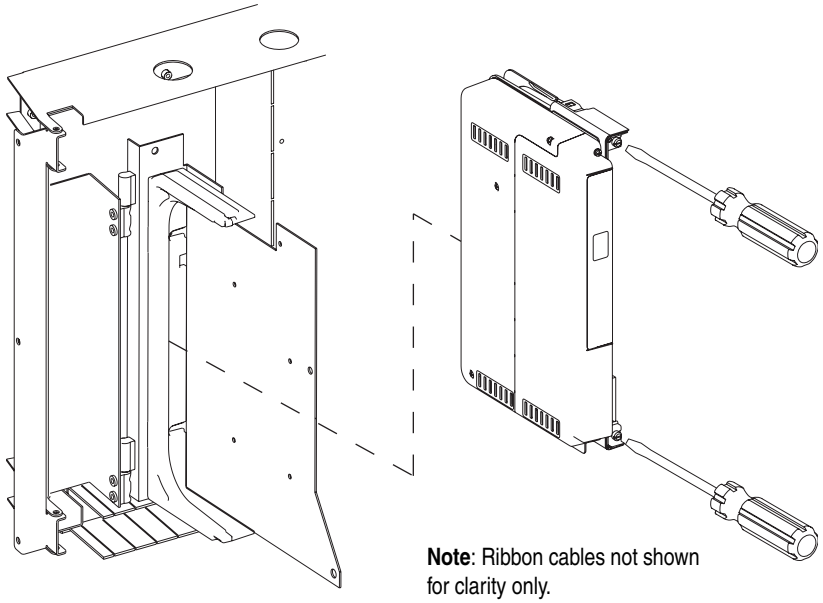


5. Carefully disconnect the ribbon cables from the sockets on the High Power Fiber Optic Interface circuit board on the back of the control mounting plate.



Note: Control mounting plate not shown for clarity only.

6. Loosen the two mounting screws on the front of the Control assembly and slide the control cassette off the mounting bracket.



Note: Ribbon cables not shown for clarity only.

Installing the 700S Phase II Control Assembly

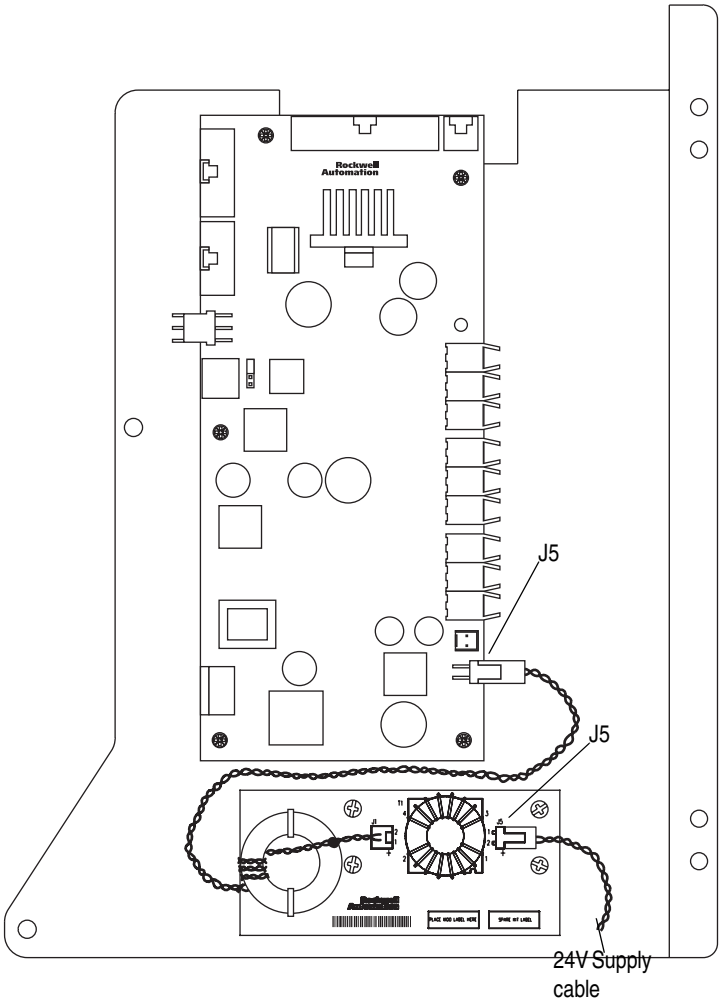
Install the 700S Phase II Control assembly in reverse order of removal.

Removing the Common Mode Filter Circuit Board

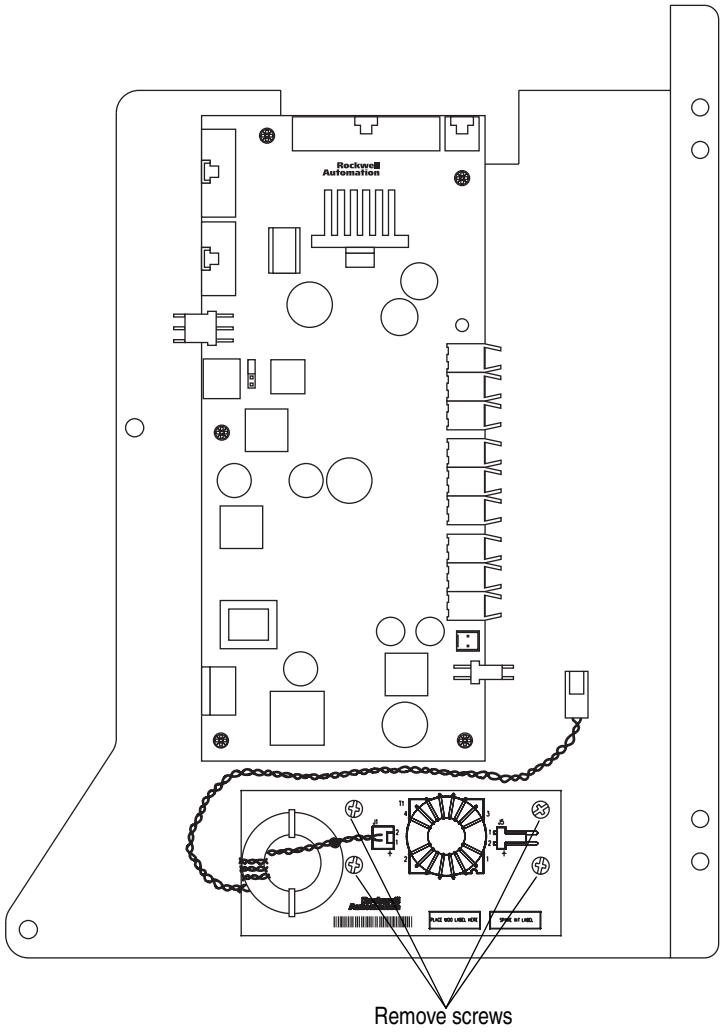
1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Loosen the captive screw on the control assembly mounting plate and swing the control assembly away from the drive.

Important: Before removing connections and wires, mark the connections and wires to avoid incorrect wiring during assembly.

3. Disconnect the 24V power supply cable from connector J5 on the Common Mode Filter circuit board.
4. Disconnect the twisted pair wires from connector J5 on the High Power Fiber Optic Interface circuit board.



5. Remove the four screws that secure the Common Mode Filter circuit board to the four standoffs on the control assembly mounting plate and remove the Common Mode Filter circuit board.

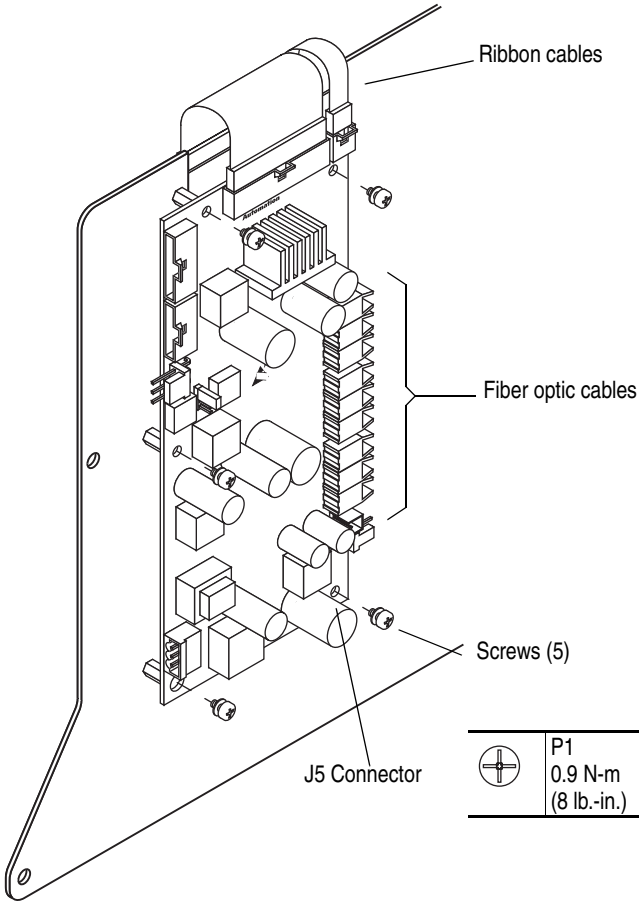


Installing the Common Mode Filter Circuit Board

Install the Common Mode Filter Circuit Board in the reverse order of removal.

Removing the 700S High Power Fiber Optic Interface Circuit Board

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Loosen the captive screw and swing the Control assembly away from drive.
3. Carefully disconnect the ribbon cables from the sockets at the top of the High Power Fiber Optic Interface circuit board, and carefully set them aside.



4. Carefully disconnect the fiber-optic cables from sockets along the right side of the High Power Fiber Optic Interface circuit board, and carefully set them aside.

ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into fiber-optic ports or fiber-optic cable connectors.

Important: Minimum inside bend radius for fiber-optic cable is 25.4 mm (1 in.). Any bends with a shorter inside radius can permanently damage the fiber-optic cable. Signal attenuation increases with decreased inside bend radii.

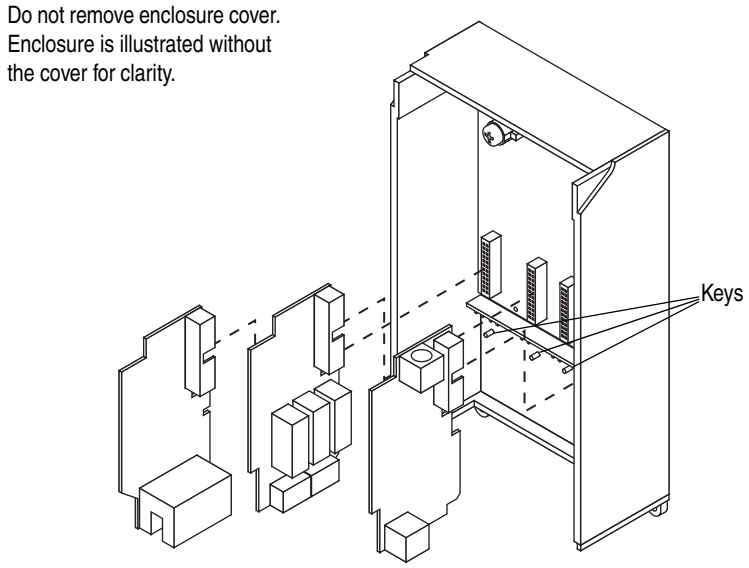
5. Disconnect the 24V power supply cable from connector J5 on the High Power Fiber Optic Interface circuit board.
6. Remove the five screws that secure the High Power Fiber Optic Interface circuit board to the Control Frame and remove the circuit board from the Control Frame.

Installing the 700S High Power Fiber Optic Interface Circuit Board

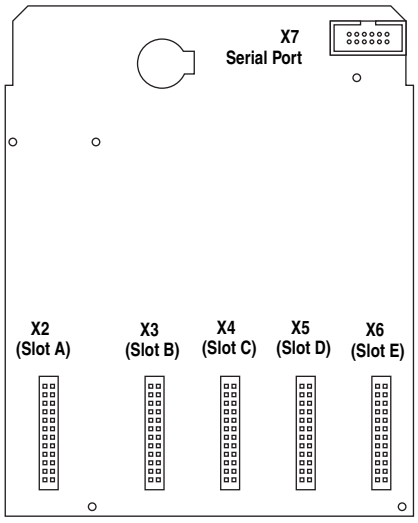
Install the 700S High Power Fiber Optic Interface circuit board in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the 700H I/O Circuit Boards and Control Assembly

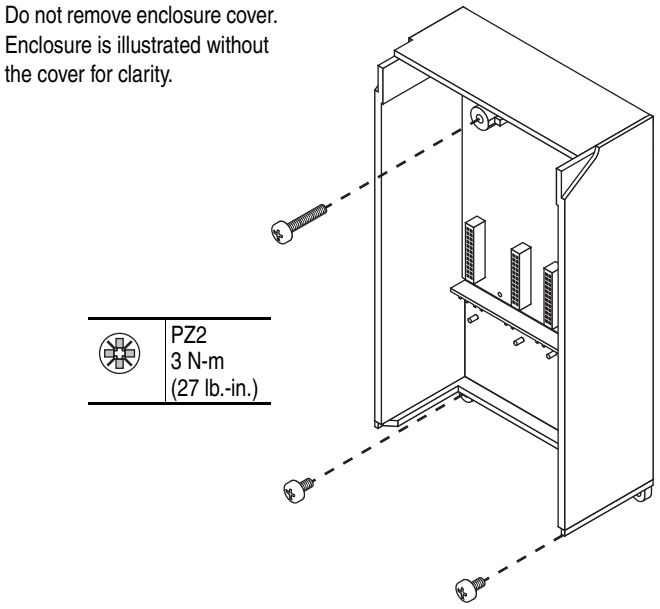
1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Open the enclosure that contains the Control and I/O circuit boards and carefully unplug the DPI cable and any I/O cables.
3. Remove the I/O circuit boards from the Control Board and enclosure. Note the order of the boards and the keys which prevent placement of the boards in incorrect slots.



4. Unplug the serial connection from X7 on the Control circuit board.



5. Remove the three screws that secure the Control assembly to the control frame and remove the control assembly.



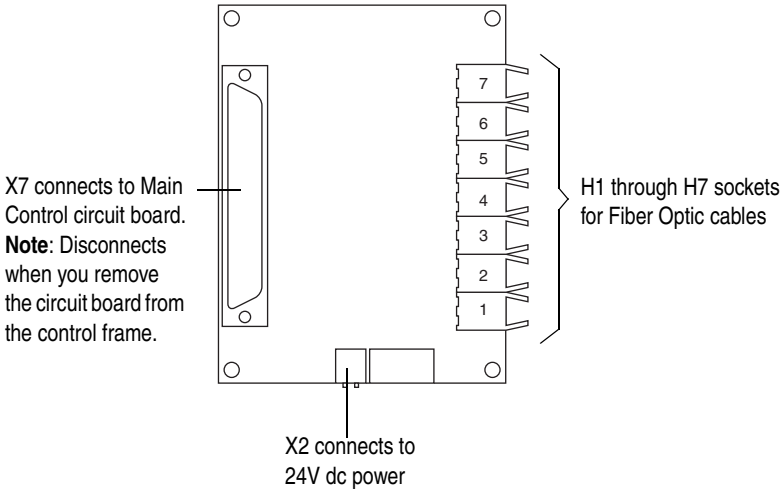
Installing the 700H I/O Circuit Boards and Control Assembly

If you replace the Control circuit board in a 700H drive, you must load information about the Control circuit board into the Power EEPROM (Refer to Loading the 700H EEPROM on page 4-1).

Install the 700H Control and I/O circuit boards in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the 700H Fiber Optic Adapter Circuit Board

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Remove the I/O circuit boards and Control assembly. Refer to Removing the 700H I/O Circuit Boards and Control Assembly on page 3-12,
3. Move the Control Frame to expose its back. Refer to Removing the Covers from the Power Structure on page 3-15.
4. Disconnect the control power cable from X2 on the Fiber Optic Adapter circuit board.

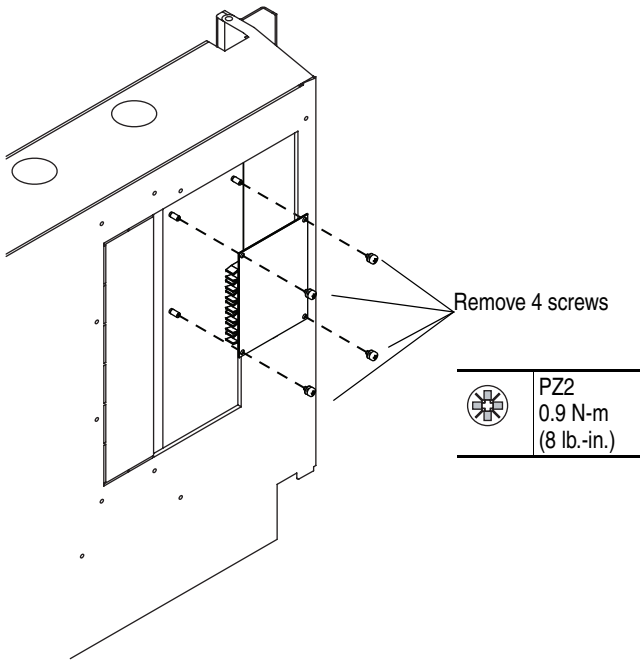


5. Carefully disconnect the fiber-optic cables from right side of the circuit board, and carefully set them aside.

ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into fiber-optic ports or fiber-optic cable connectors.

Important: Minimum inside bend radius for fiber-optic cable is 25.4 mm (1 in.). Any bends with a shorter inside radius can permanently damage the fiber-optic cable. Signal attenuation increases with decreased inside bend radii.

6. Remove the four screws which secure the Fiber Optic Adapter bracket to the stand-offs on the back of the Control Frame.



7. Remove the Fiber Optic Adapter Board from the Control Frame.

Installing the 700H Fiber Optic Adapter Circuit Board

Install the 700H Fiber Optic Adapter circuit board in reverse order of removal, while referring to Torque Specifications on page 3-2.

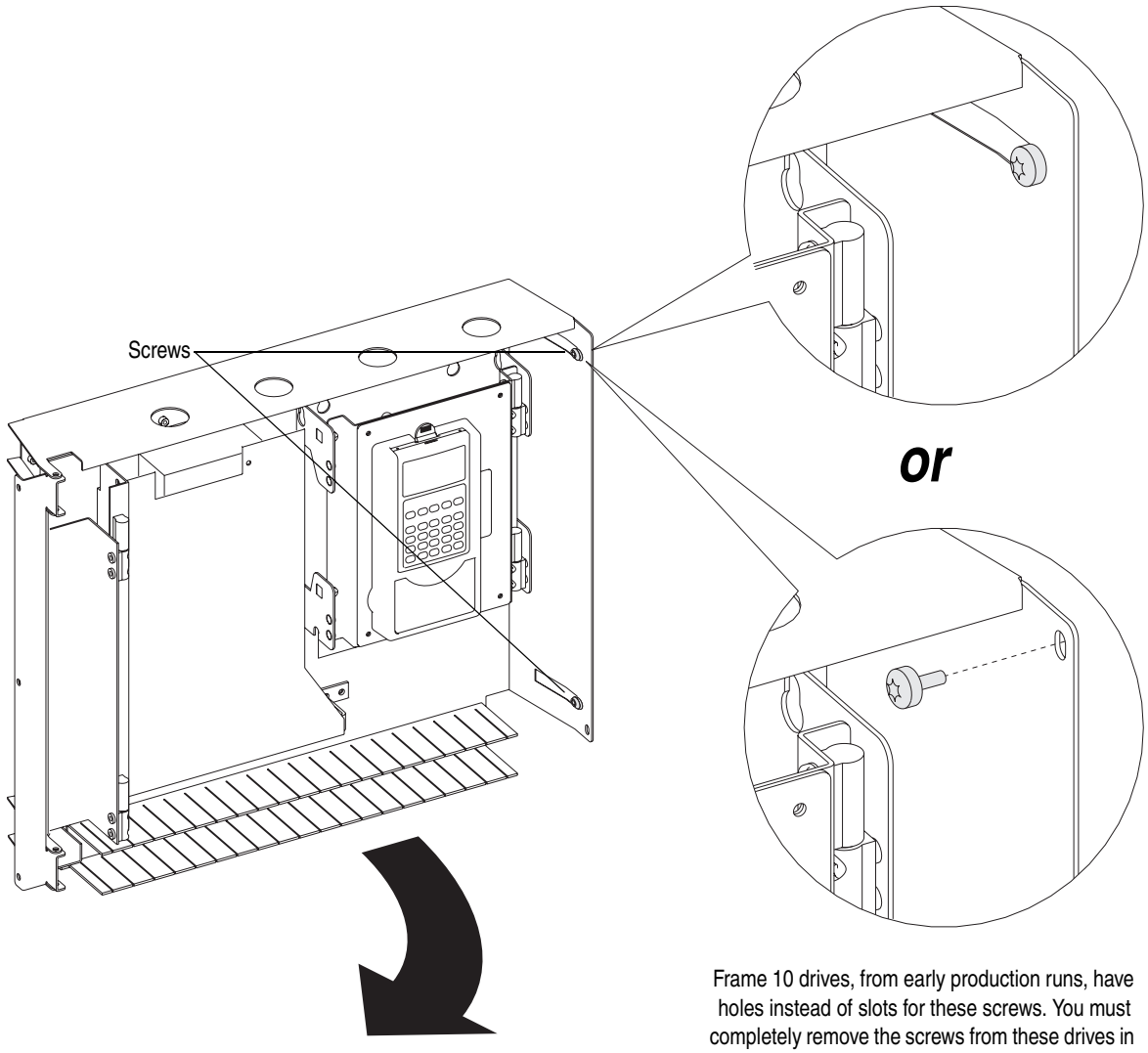
Removing the Covers from the Power Structure

You must remove the protective covers to gain access to the power structure.

Moving the Control Frame

You must first move the Control Frame in order to remove the protective covers from the drive.

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Loosen the T8 Torx-head screws that secure the Control Frame to the drive enclosure (remove screws on early frame 10 drives).
3. Swing the Control Frame out and away from the power structure.

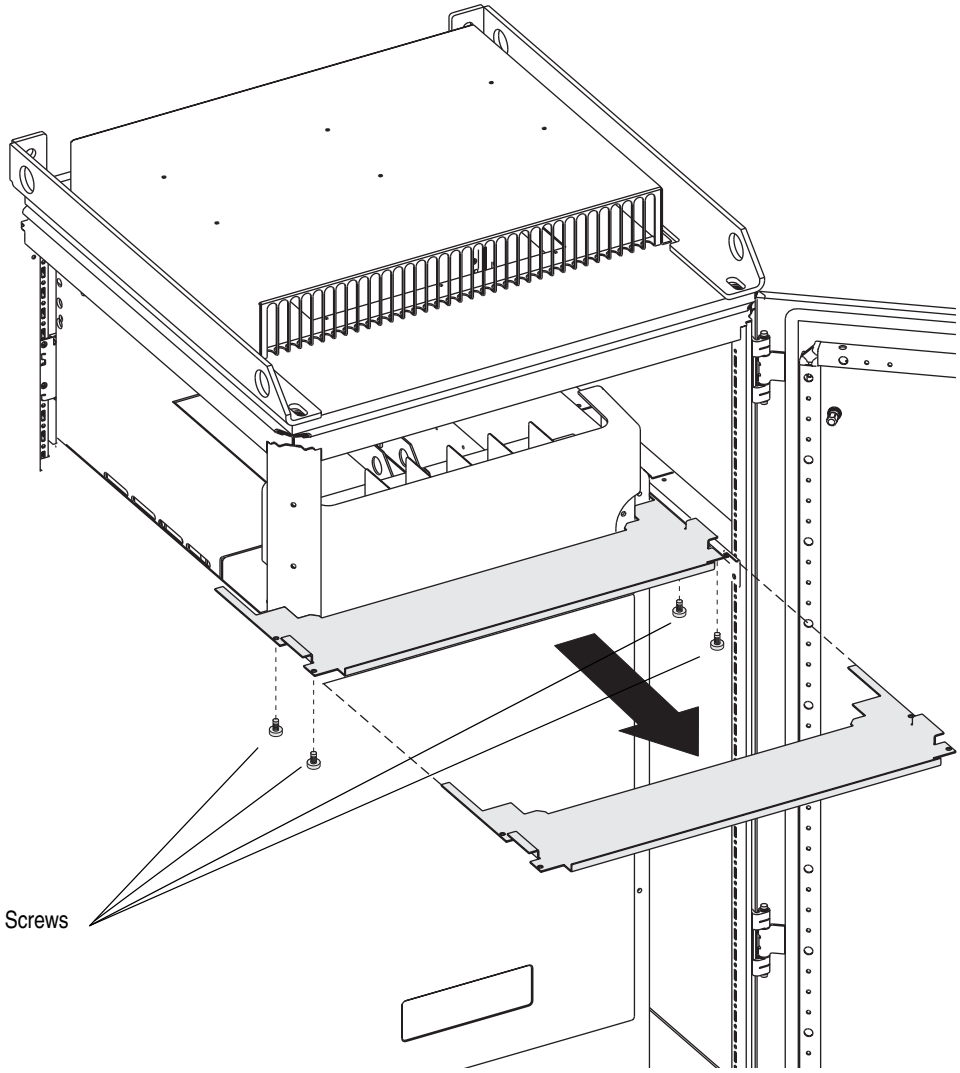


Frame 10 drives, from early production runs, have holes instead of slots for these screws. You must completely remove the screws from these drives in order to swing-open the control frame.

Removing the Airflow Plate

The drive is equipped with a plate, just above the Control Frame, that manages airflow through the drive. You must remove this plate in order to remove the protective covers.

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Move the Control Frame away from the power structure. Refer to Removing the Covers from the Power Structure on page 3-15.



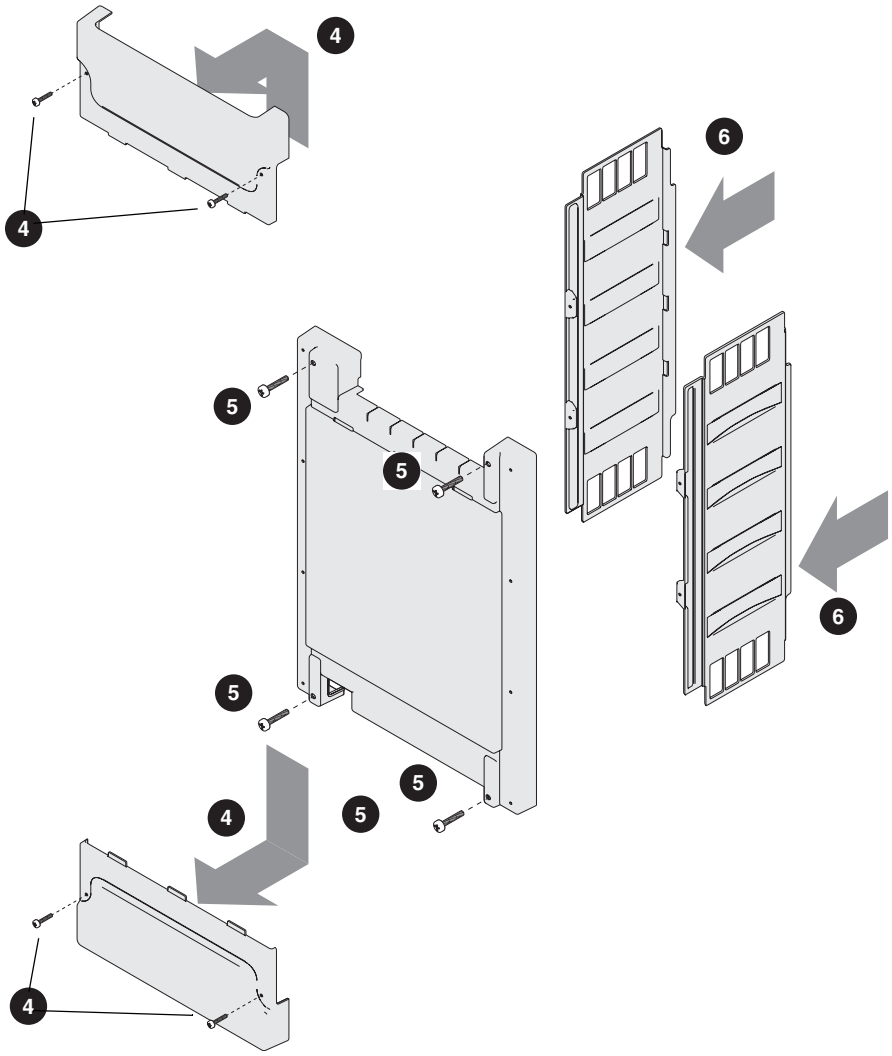
3. Remove the T8 Torx-head screws that secure the airflow plate to the drive and remove the air flow plate from the drive enclosure.

Removing the Protective Covers from Power Structure

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Move the Control Frame away from the power structure. Refer to Removing the Covers from the Power Structure on page 3-15.
3. Remove the Airflow Plate. Refer to Removing the Airflow Plate on page 3-17.
4. Remove the four M5 POZIDRIV screws that secure the top and bottom protective covers to the main front protective cover, then remove the top and bottom protective covers.

   Note: *you only need to remove the top and bottom covers to gain access to the power terminals. You can remove the other covers without removing the top and bottom covers.*
5. Remove the four M5 POZIDRIV screws that secure the main front protective cover to the drive, then remove the protective cover.

6. Remove the side protective covers.



Installing the Protective Covers

Install the Protective Covers in reverse order of removal, while referring to Torque Specifications on page 3-2.

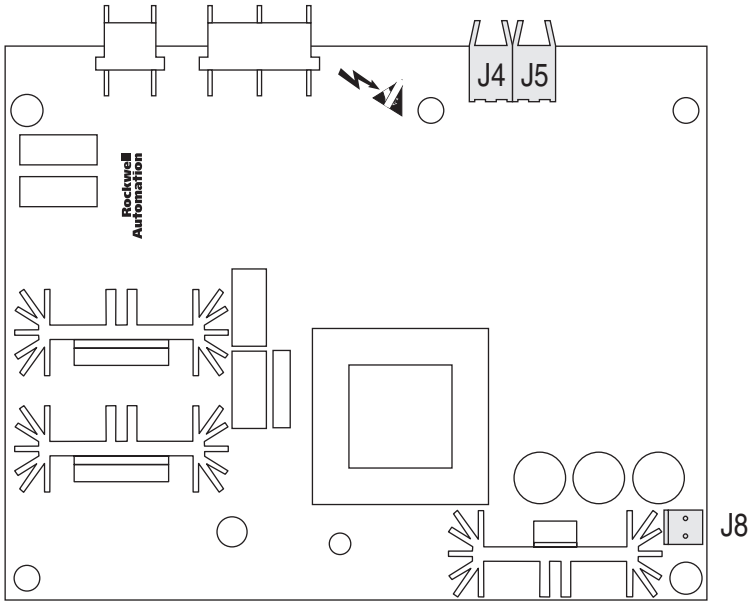
Removing the 700S Voltage Feedback Circuit Board

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Covers from the Power Structure on page 3-15.
3. Carefully disconnect the fiber-optic cables from the J4 and J5 sockets along the top of the Voltage Feedback circuit board, and carefully set them aside.

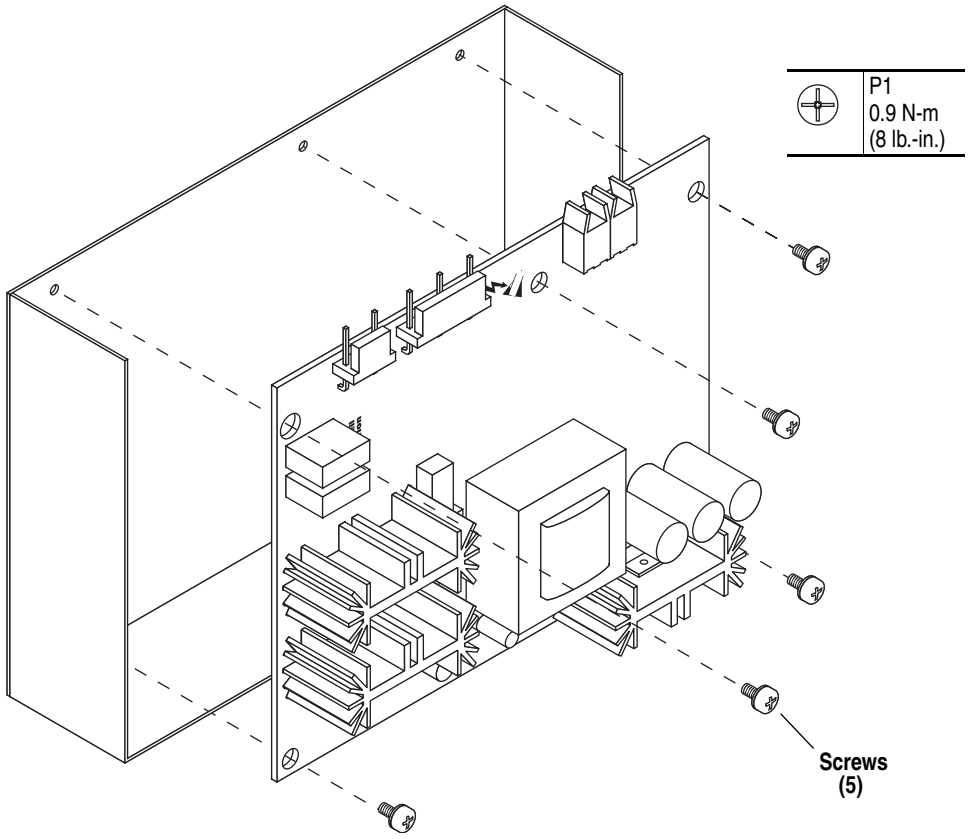
ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into fiber-optic ports or fiber-optic cable connectors.

Important: Minimum inside bend radius for fiber-optic cable is 25.4 mm (1 in.). Any bends with a shorter inside radius can permanently damage the fiber-optic cable. Signal attenuation increases with decreased inside bend radii.

4. Disconnect the cable from the J8 socket of the Voltage Feedback circuit board, and set it aside.



5. Remove the five screws that secure the Voltage Feedback circuit board to the drive and remove the circuit board from the drive.

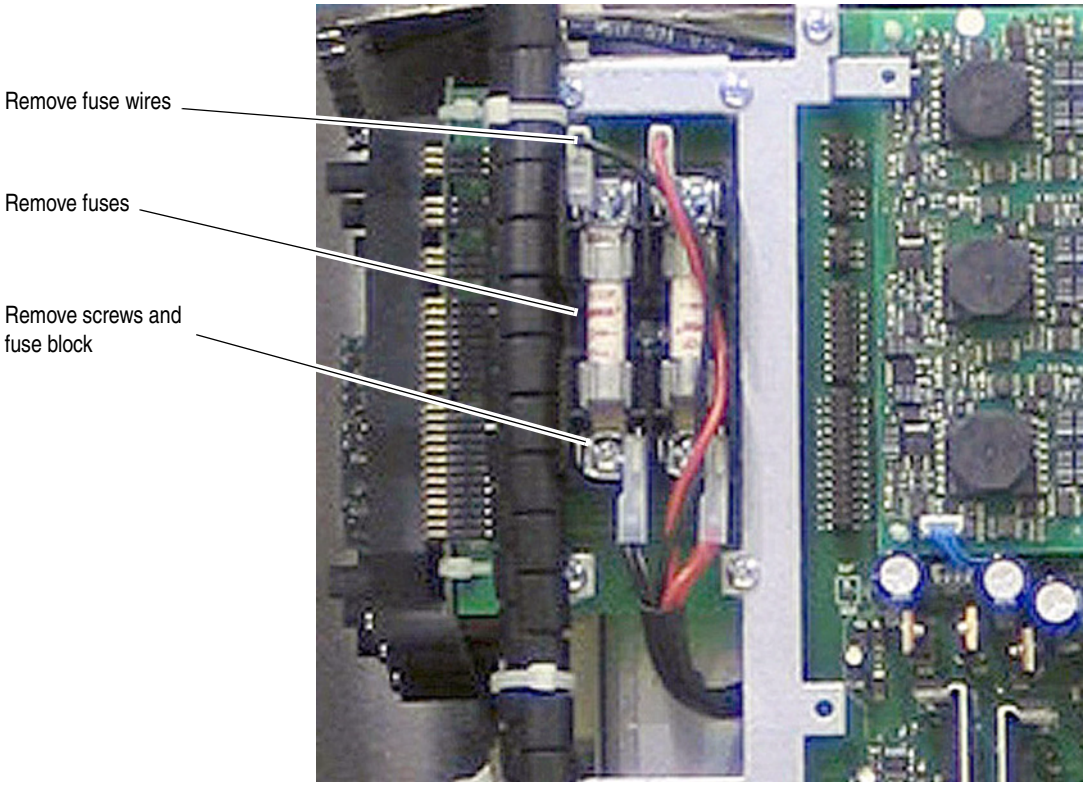


Installing the 700S Voltage Feedback Circuit Board

Install the 700S Voltage Feedback circuit board in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the Gate Driver and Adapter Circuit Boards

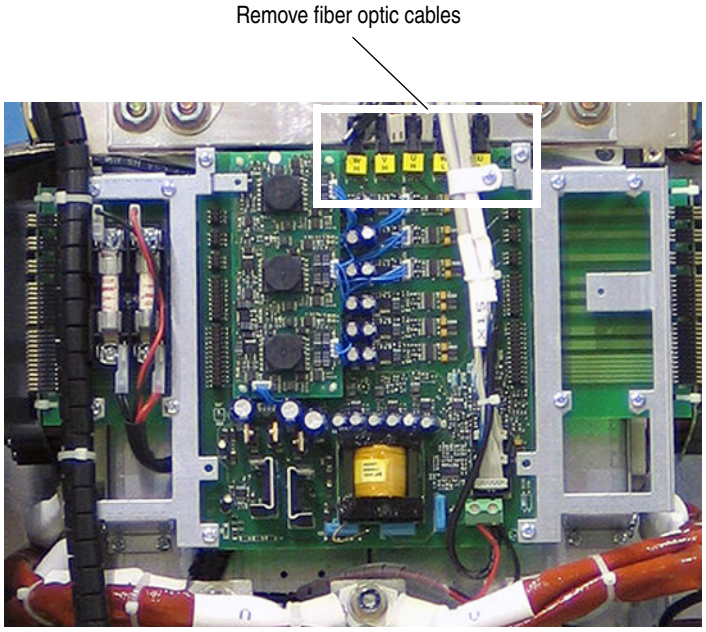
1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Covers from the Power Structure on page 3-15.
3. Disconnect the wires from the fuse block that holds the fuses for the Fan Inverters and remove the fuses.
4. Remove the four screws that secure the fuse block to the bracket beneath it and remove the fuse block.



5. Carefully disconnect the fiber-optic cables from sockets along the top of the Gate Driver circuit board and carefully set them aside.

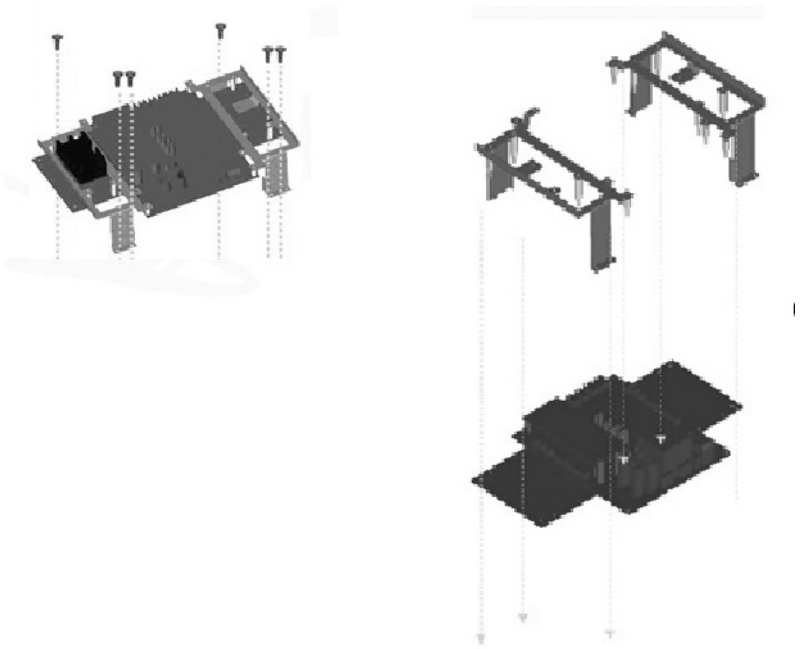
ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into fiber-optic ports or fiber-optic cable connectors.

Important: Minimum inside bend radius for fiber-optic cable is 25.4 mm (1 in.). Any bends with a shorter inside radius can permanently damage the fiber-optic cable. Signal attenuation increases with decreased inside bend radii.

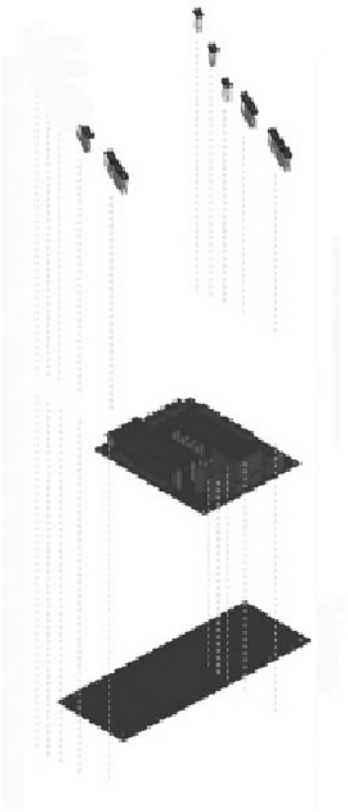


6. Disconnect the other cables from the sockets of the Gate Driver board and set them aside.

7. Remove the six screws that secure the brackets to the drive and remove the brackets.



8. Remove eight of the stacker connectors from the Gate Driver board, leaving the two smaller ones which are third from the top.



9. Carefully remove the Gate Driver board and the remaining connectors.

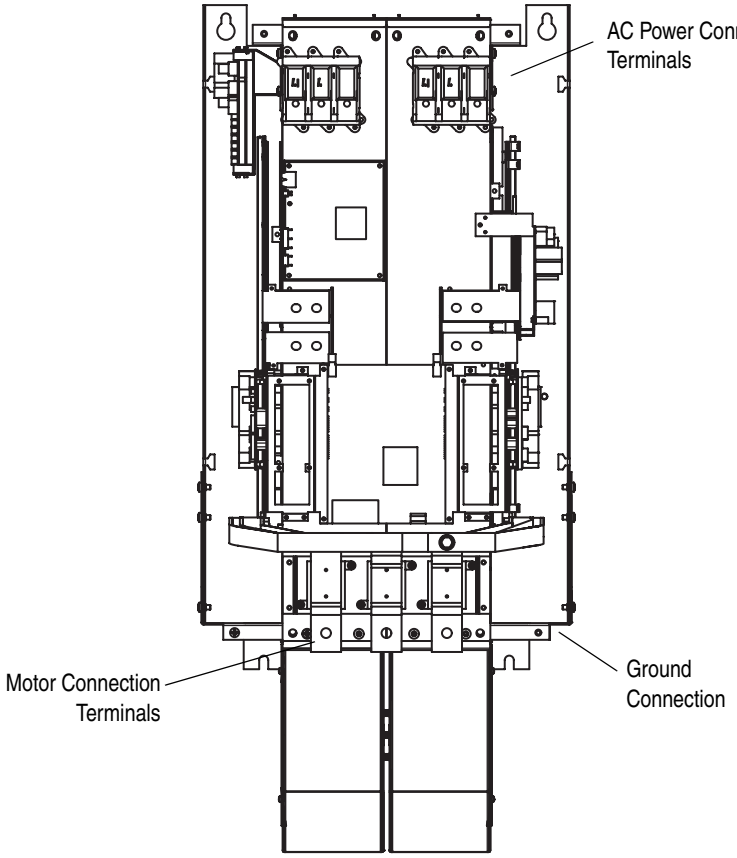
10. Remove the cable ties that secure the Adapter board to the circuit boards on the Output Power Modules and remove the Adapter board.

Installing the Gate Driver and Adapter Circuit Boards

1. Replace the Adapter board and install the cable ties that secure it to the circuit boards on the Output Power Modules.
2. Plug the old stacker connectors into the new Gate Driver board so the pins do not protrude through the connectors on the back of the board.
3. Align the Gate Driver board so that its connectors align with the mating connectors on the Adapter board.
4. While supporting the Adapter board from behind, press the Gate Driver board onto it.
5. Verify the proper alignment of the mounting with a mirror. Verify that none of the pins in the stacker connectors have missed the mating connectors.
6. Install the brackets and install and tighten the mounting screws.
7. Connect all of the cables on the Gate Driver board.

Removing the Power Structure from the Drive Enclosure

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Covers from the Power Structure on page 3-15.



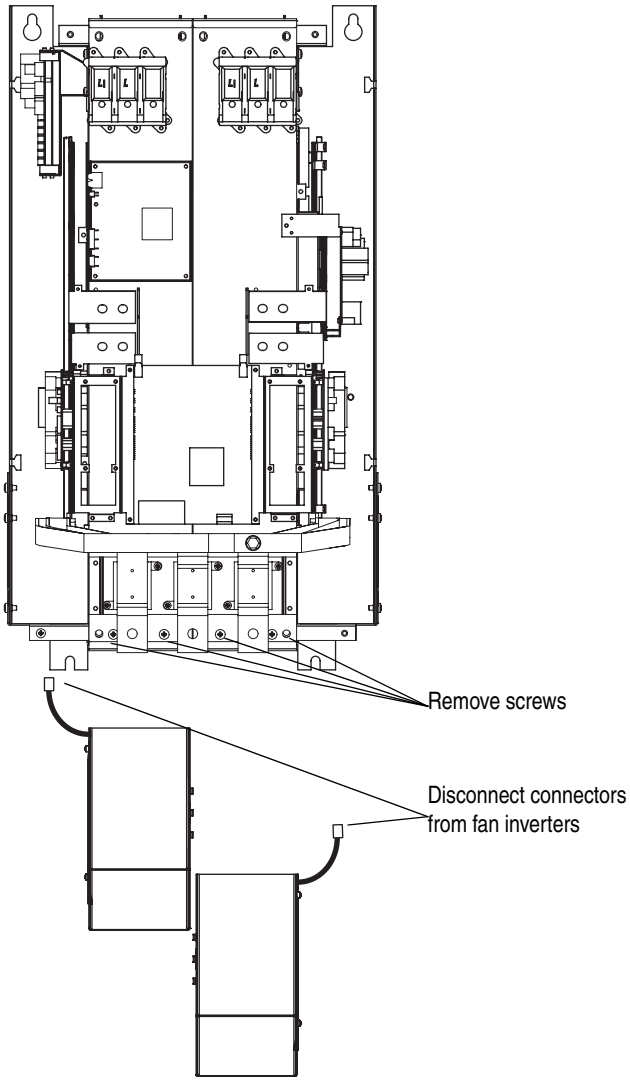
3. Remove the motor wiring from the power structure at the front of the power structure.
4. Remove the ground connection from the lower right rear corner of the power structure.
5. Remove the AC power wiring from the incoming terminals at the top of the power structure.
6. Follow the instructions in publication PFLEX-IN014…, *Installation Instructions - PowerFlex 700S /700H High Power Maintenance Stand*, to install the Maintenance Stand. Remove the power structure by sliding it onto the rails of the Maintenance Stand.

Installing the Power Structure in the Drive Enclosure

Install the power structure in reverse order of removal, while referring to Torque Specifications on page 3-2. Refer to the publication PFLEX-IN006…, *Installation Instructions - PowerFlex 700S and 700H High Power Drives*, for tightening torques of motor terminations.

Removing the Main Fans

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Covers from the Power Structure on page 3-15.
3. Disconnect the fan cable connectors under the power structure.
4. Remove the two screws that secure each fan to the drive (there are two fans and four screws). Then remove the fans.



Installing the Main Fans

Install the fans in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the ASIC Circuit Board

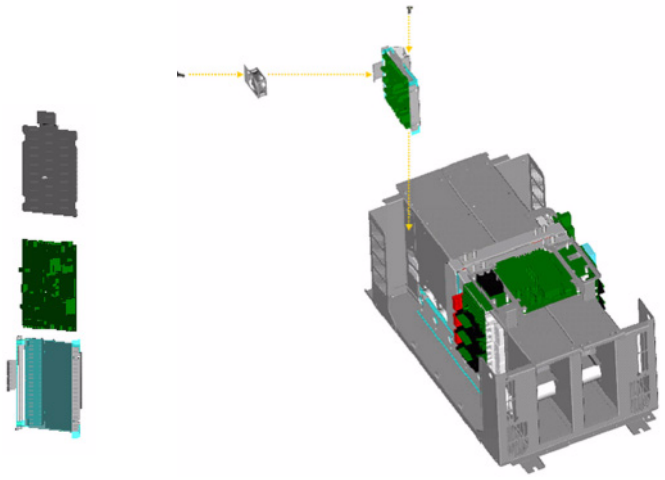
ATTENTION: The sheet metal cover and mounting screws on the ASIC circuit board located on the power structure are energized at (-) DC bus potential high voltage. Risk of electrical shock, injury, or death exists if someone comes into contact with the assembly.

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Covers from the Power Structure on page 3-15.
3. Remove the power structure for the drive. Refer to Removing the Power Structure from the Drive Enclosure on page 3-27.
4. Carefully disconnect the fiber-optic cables from sockets (H1 - H7) along the front of the ASIC board, and carefully set them aside.

ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into fiber-optic ports or fiber-optic cable connectors.

Important: Minimum inside bend radius for fiber-optic cable is 25.4 mm (1 in.). Any bends with a shorter inside radius can permanently damage the fiber-optic cable. Signal attenuation increases with decreased inside bend radii.

5. Disconnect the other cables from sockets on the front of the ASIC board and set them aside.
6. Disconnect the wire connected to the cover of the ASIC board.
7. Remove the fan from the ASIC board.



8. Slide the ASIC board assembly out of its chassis.
9. Remove the plastic board holder.
10. Carefully disconnect the fiber-optic cables from sockets (H8, - H13) along the back of the ASIC board and carefully set them aside.
11. Disconnect the other cables from sockets on the ASIC board and set them aside.

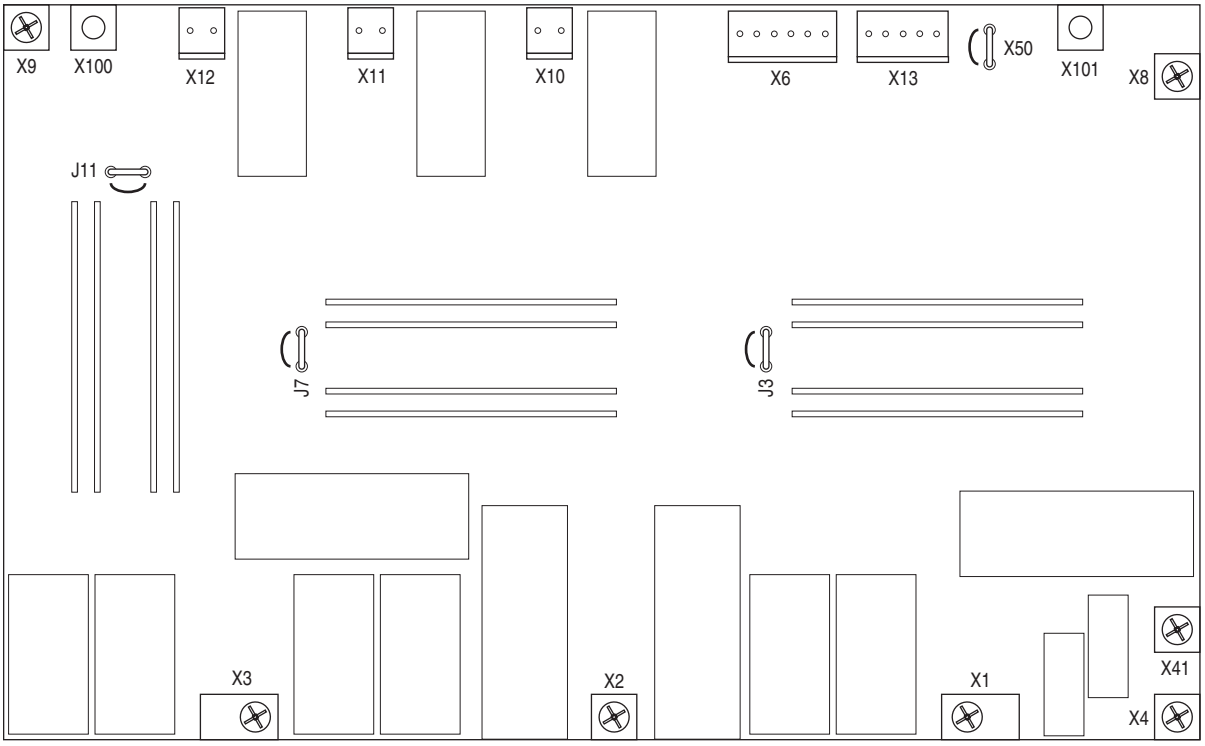
Installing the ASIC Circuit Board

Install the ASIC board in reverse order of removal, while referring to Torque Specifications on page 3-2. Reconnect the cables to ASIC board, while referring to Figure B.3 on page B-4, Figure B.4 on page B-5 or Figure B.5 on page B-6.

Removing the Rectifying Circuit Board

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Covers from the Power Structure on page 3-15.
3. Remove the power structure for the drive. Refer to Removing the Power Structure from the Drive Enclosure on page 3-27.
4. Disconnect all the wiring from connectors X10, X11, X12, X13 the Rectifying board and carefully set it aside.
5. Remove the screws that secure the circuit board to the Rectifying Module and remove the board.

Series A Rectifying Board Shown

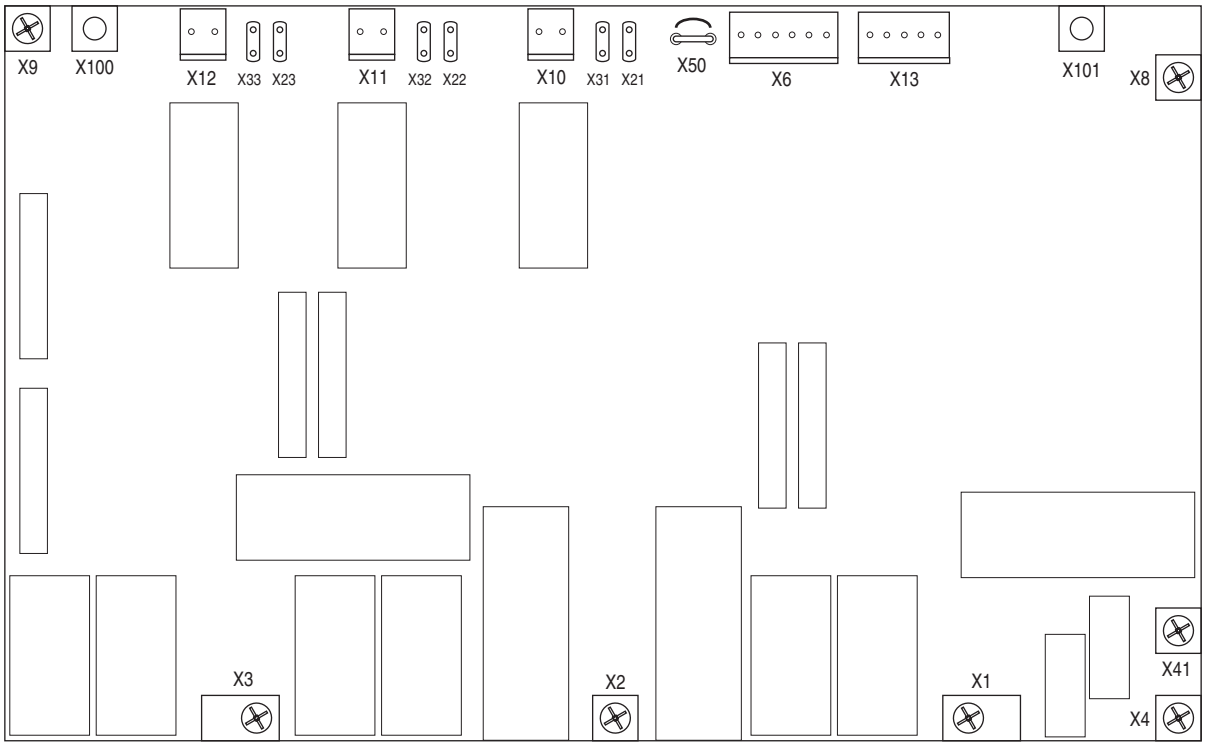


Installing the Rectifying Circuit Board

Install the Rectifying circuit board in reverse order of removal, while referring to Torque Specifications on page 3-2.

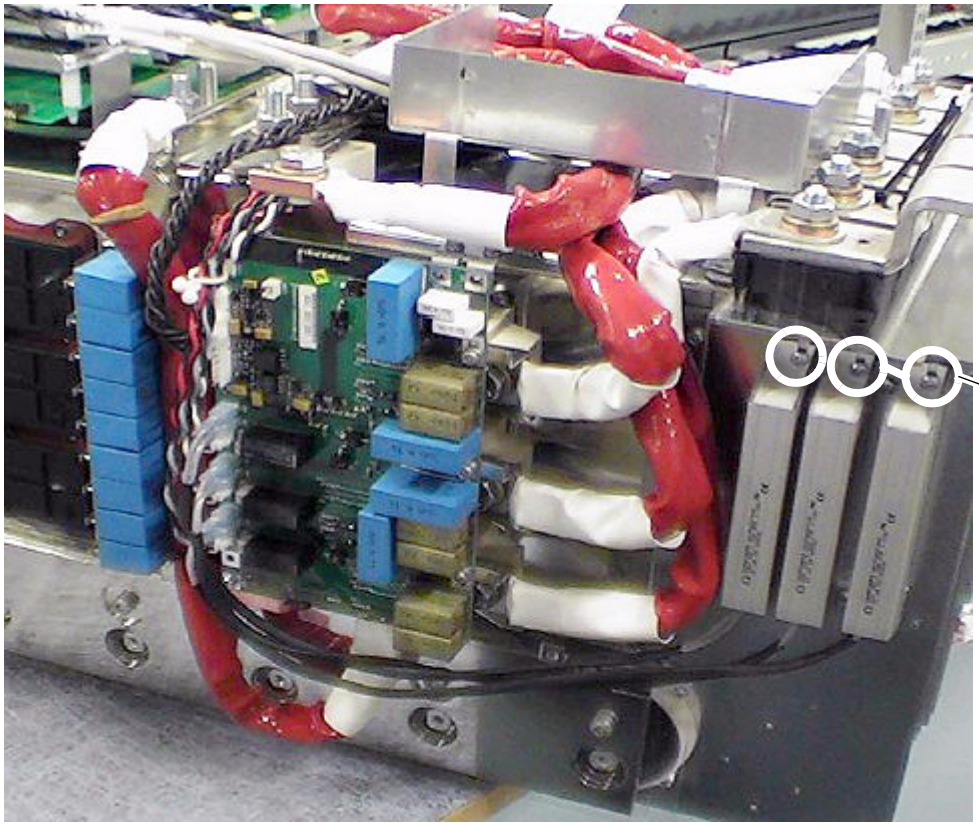
Removing the Precharging Resistors from Series B Drives

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Covers from the Power Structure on page 3-15.
3. Remove the power structure for the drive. Refer to Removing the Power Structure from the Drive Enclosure on page 3-27.
4. Disconnect the wiring from connectors X21 and X31, X22 and X32, and X23 and X33 on the Rectifying board.

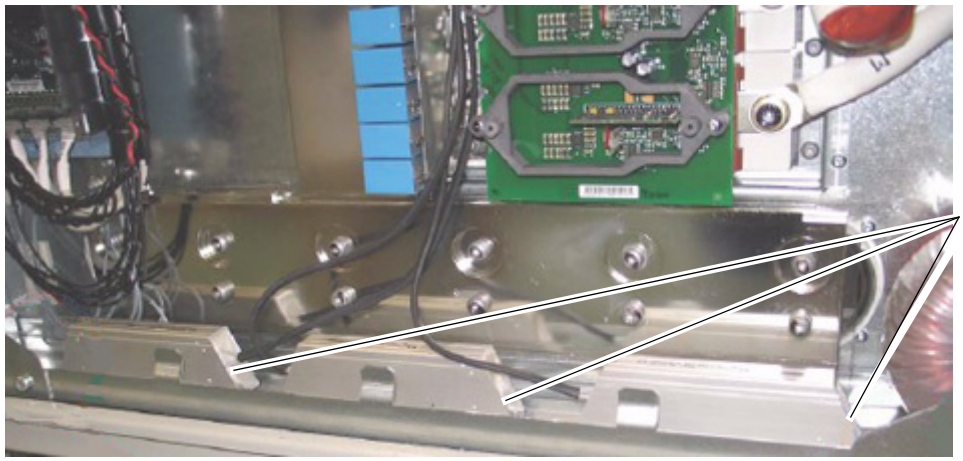


5. Remove the two screws that secure each of the Precharging Resistors to the drive frame and remove the Precharging Resistors.

6-Pulse Drive



12-Pulse Drive



Installing the Precharging Resistors on Series B Drives

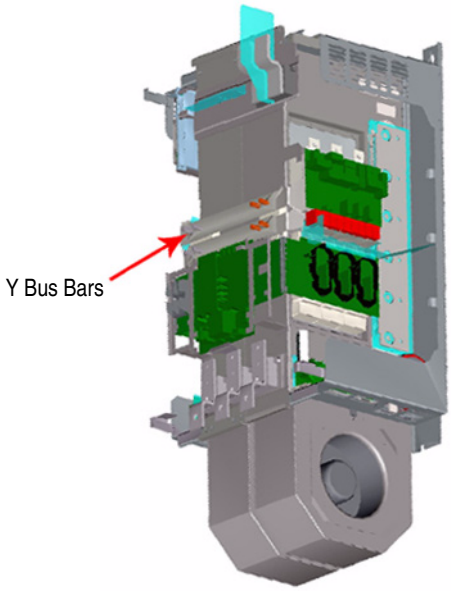
Install the Precharging Resistors in reverse order of removal.

Removing the Left-Side Output Power Module

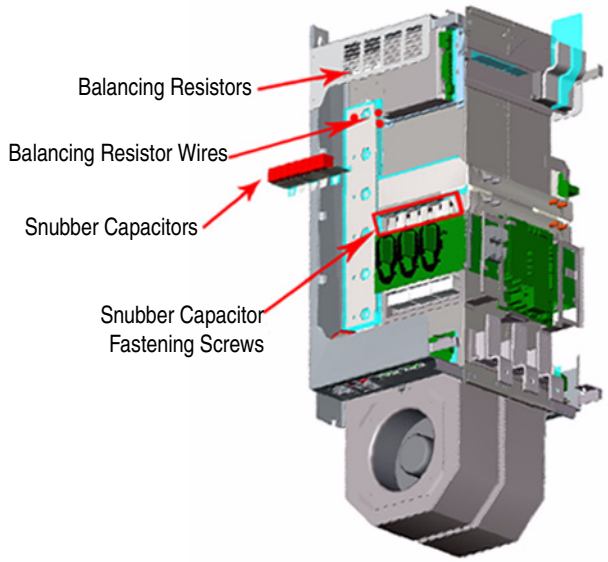
Important: Do not attempt to disassemble the Output Power Module.

Important: Always replace the Output Power Modules in pairs (do not replace just one module).

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Covers from the Power Structure on page 3-15.
3. Remove the power structure from the drive cabinet. Refer to Removing the Power Structure from the Drive Enclosure on page 3-27.
4. Remove the cable-tie that secures the Power Module circuit board to the Adapter board.
5. Disconnect the output leads from the bottom of the Output Power Module.
6. Remove the Y bus bars.

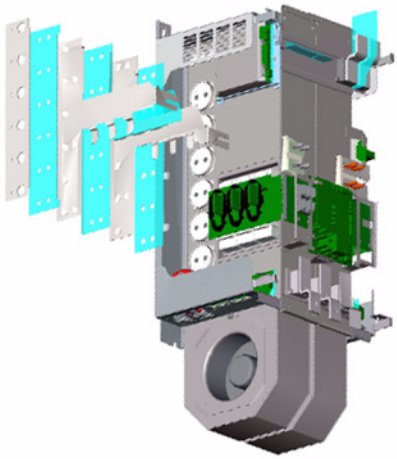


7. Remove the balancing resistor wires from the bus bars.



8. Remove the screws that secure the Snubber Capacitors and remove the Snubber Capacitors from the power structure.

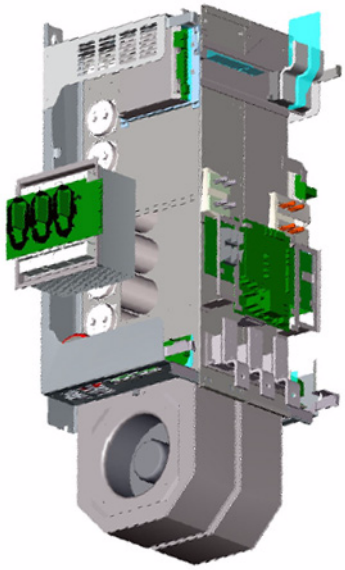
9. Remove the screws that secure the DC bus bars to the left side of the power structure and remove the DC bus bars.



10. Remove the screws that secure the Output Power Module to the drive.

11. Disconnect the Power Module circuit board from the Adapter board.

12. Remove the Output Power Module from the drive.



Installing the Left-Side Output Power Module

Important: If you replace the Output Power Modules in a 700H drive, you must load information about the Power Modules into the Power EEPROM (refer to Loading the 700H EEPROM on page 4-1).

Install the Output Power Module in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the Right-Side Output Power Module and Rectifying Module

Important: Do not attempt to disassemble the Output Power Module.

Important: Always replace the Output Power Modules in pairs (do not replace just one module).

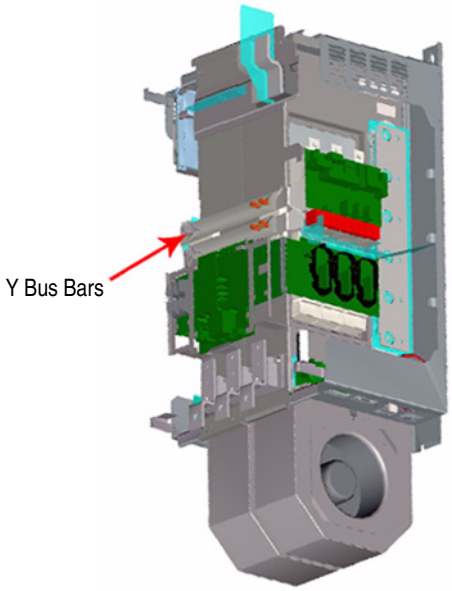
1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Covers from the Power Structure on page 3-15.
3. Remove the power structure from the drive cabinet. Refer to Removing the Power Structure from the Drive Enclosure on page 3-27.

4. Carefully disconnect the fiber-optic cables from the Gate Driver board and carefully set them aside.

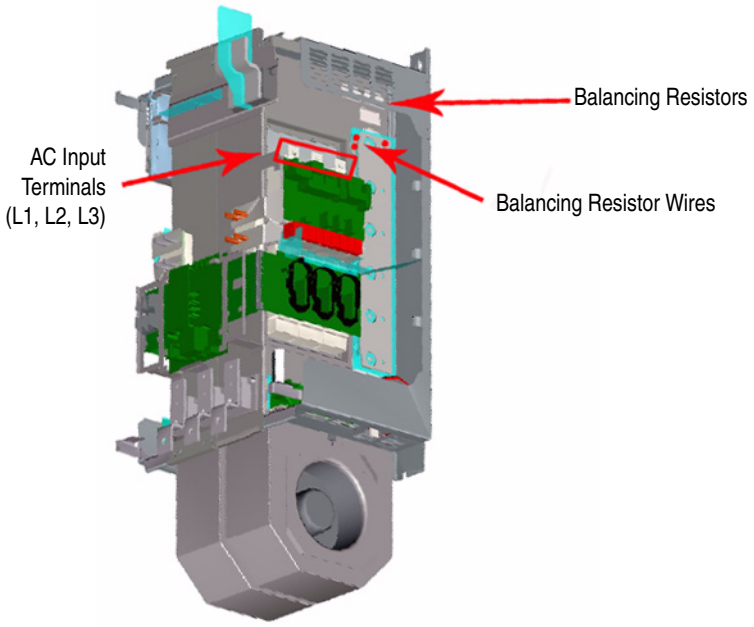
ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into fiber-optic ports or fiber-optic cable connectors.

Important: Minimum inside bend radius for fiber-optic cable is 25.4 mm (1 in.). Any bends with a shorter inside radius can permanently damage the fiber-optic cable. Signal attenuation increases with decreased inside bend radii.

5. Remove the cables from X13, X14 and X15 sockets on the Gate Driver board and carefully set them aside.
6. Disconnect the DC Bus wiring from the Gate Driver board.
7. Remove the cable-tie that secures the Power Module circuit board to the Adapter board.
8. Disconnect the output leads from the bottom of the Output Power Module.
9. Remove the Y bus bars.



10. Remove the balancing resistor wires from the bus bars.

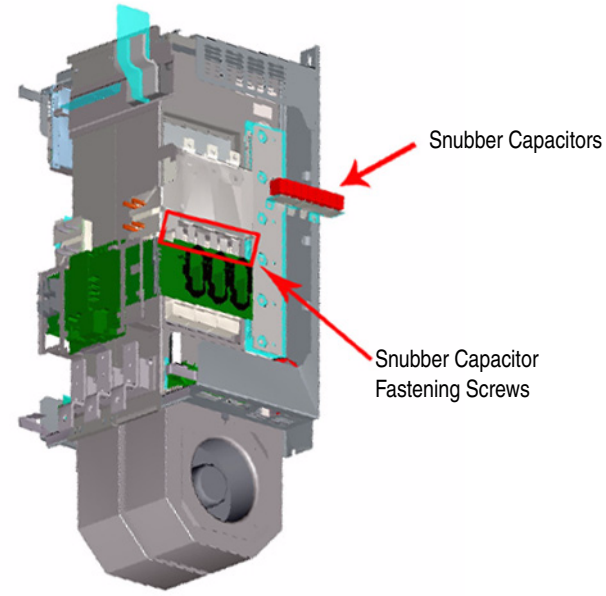


11. Disconnect all wiring from the circuit board on the Rectifying Module.

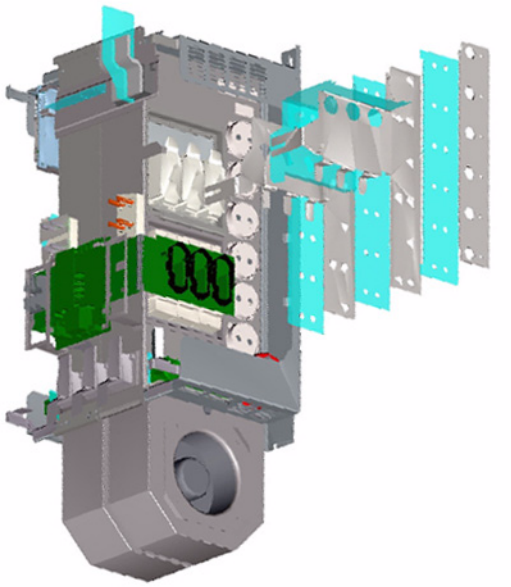
12. Disconnect the cables from the AC input terminals on the Rectifying Module.

13. Remove the circuit board from the Rectifying Module (refer to Removing the Rectifying Circuit Board on page 3-31).

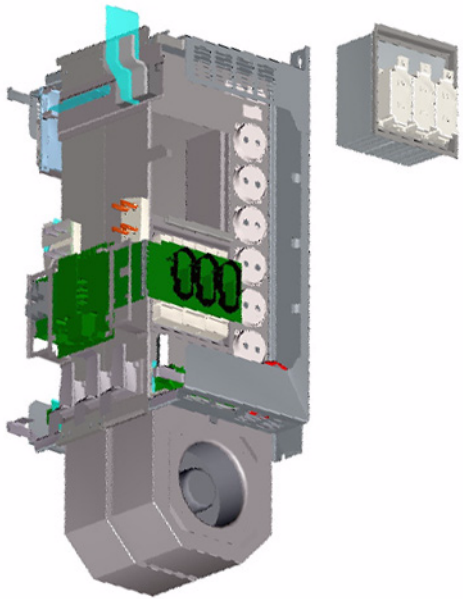
14. Remove the screws that secure the Snubber Capacitors and remove the Snubber Capacitors.



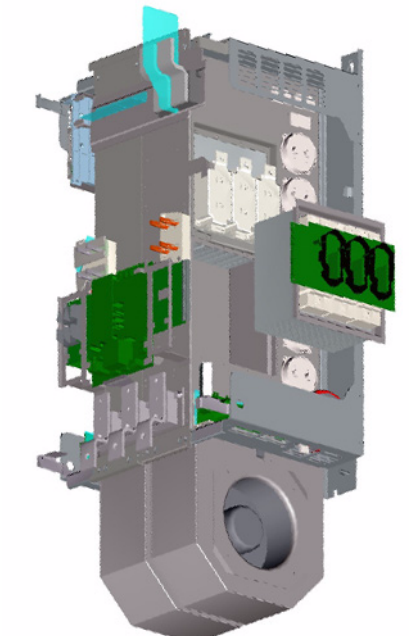
15. Remove the screws that secure DC bus bars to right side of power structure and remove the DC bus bars.



16. Remove the screws that secure the Rectifying Module to the power structure and remove the Rectifying Module.



17. Remove the screws that secure the Output Power Module to the power structure and remove the Output Power Module.



Installing the Right-Side Output Power Module and Rectifying Module

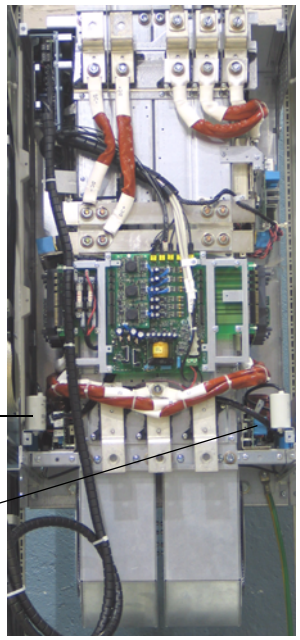
Important: If you replace the Output Power Modules in a 700H drive, you must load information about the Power Modules into the Power EEPROM (Refer to Loading the 700H EEPROM on page 4-1).

Install the Output Power Module in reverse order of removal, while referring to Torque Specifications on page 3-2.

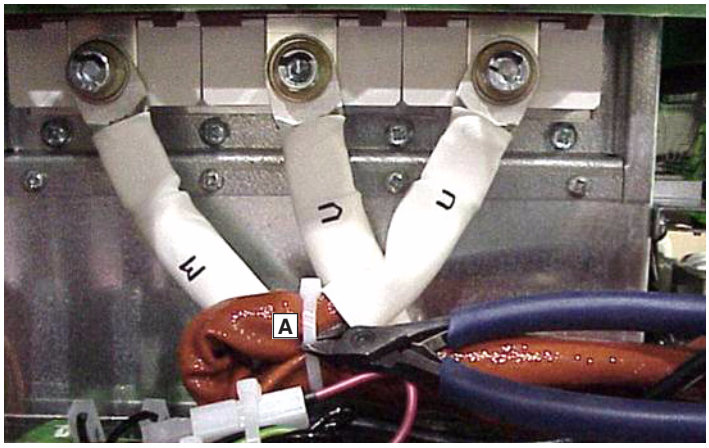
Removing the Fan Inverters

1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Covers from the Power Structure on page 3-15.
3. Remove the power structure from the drive cabinet. Refer to Removing the Power Structure from the Drive Enclosure on page 3-27.

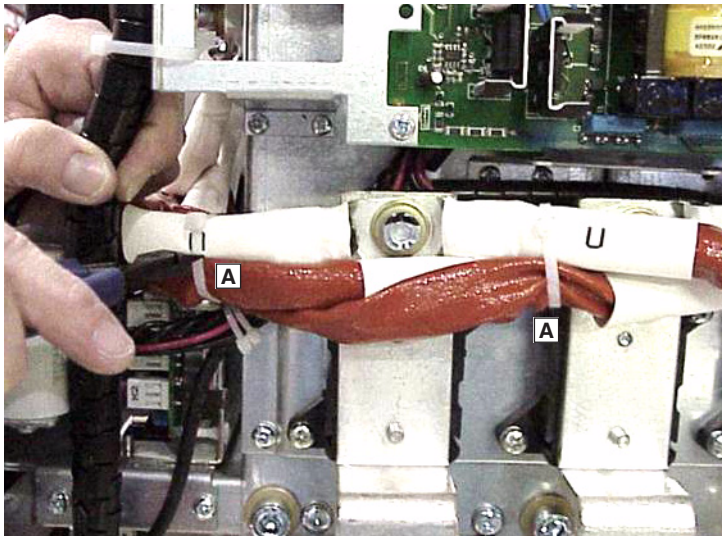
4. Prepare the Power Structure for Inverter assembly removal.



Task	Description
A	Remove the cable-ties that secure the cables with orange insulation (on both left-hand and right-hand sides). This will allow you to move the cables while removing the inverter assemblies.



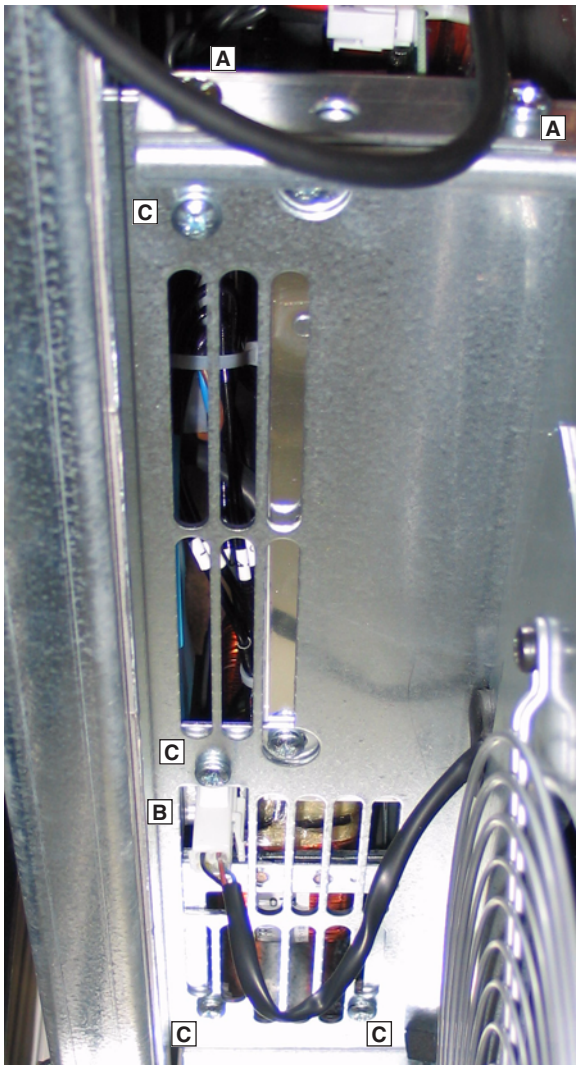
Left-hand
Side
View



Front View
on Left-hand Side

5. Remove the Inverter assemblies.

Task	Description
A	Remove the two M5 POZIDRIV screws that secure the front of the fan inverter to the drive.
B	Disconnect the fan motor cable under the inverter.
C	Remove the four M5 POZIDRIV screws that secure the bottom of the fan inverter to the drive.
D	Disconnect the cables at X2, X8 and X3 (on left-hand and center inverters); and X2 and X8 (on right-hand inverter).
E	Carefully remove the inverters by sliding them out towards the front of the drive.



Bottom View
of Power Structure

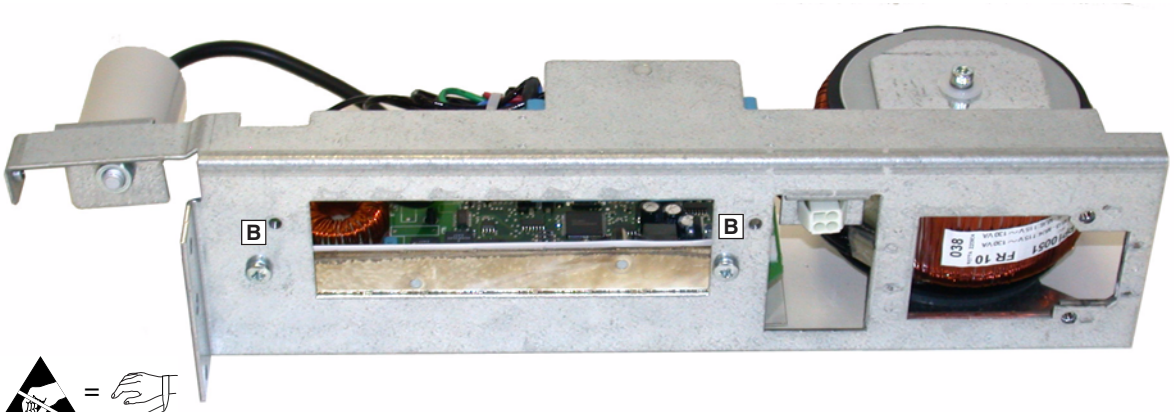
Important: Take care to not damage the output transformer when removing or installing the inverter.

6. Remove the Inverter from the old Inverter assembly.

Task	Description
A	Disconnect the cables at connectors X4 (Blue) and X5 (Black).

Right-hand Inverter Shown

Task	Description
B	Remove two M5 POZIDRIV screws that secure the inverter board and heatsink to the assembly carriage.
C	Carefully remove the inverter board and heatsink from the assembly carriage.

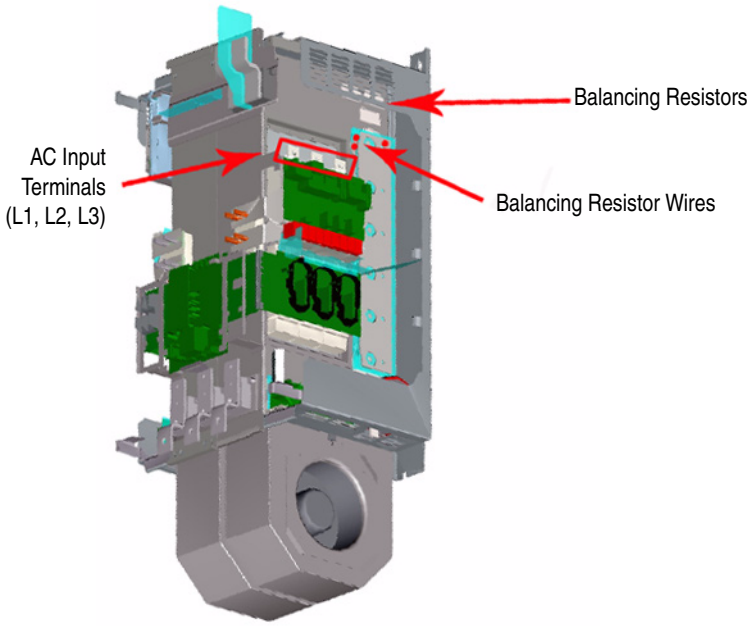


Installing the Fan Inverters

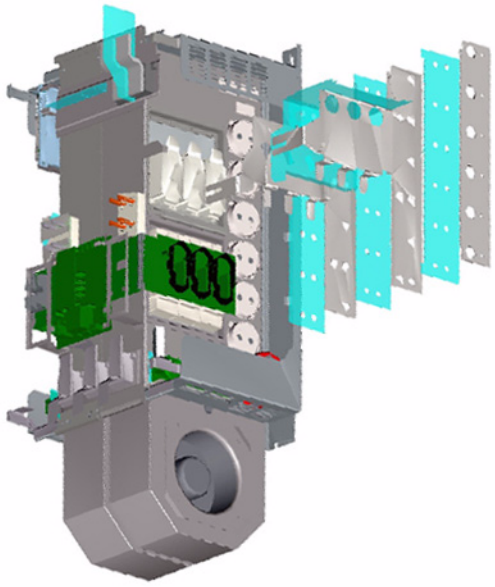
Install the fan inverters in reverse order of removal, while referring to Torque Specifications on page 3-2.

Removing the DC Bus Capacitors

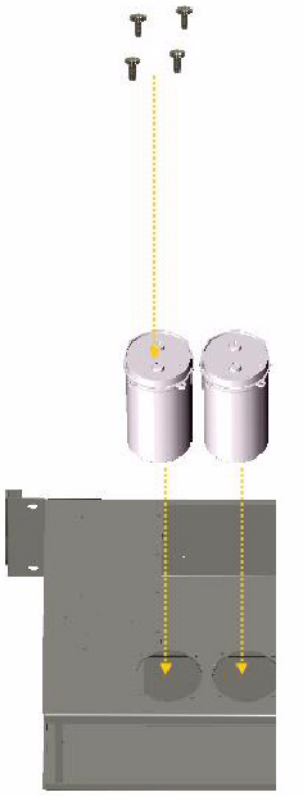
1. Remove power from the drive. Refer to Removing Power from Drive on page 3-3.
2. Remove the covers from the power structure. Refer to Removing the Covers from the Power Structure on page 3-15.
3. Remove the power structure from the drive cabinet. Refer to Removing the Power Structure from the Drive Enclosure on page 3-27.
4. Remove the balancing resistor wires from bus bars.



5. Remove the screws that secure DC bus bars to right side of power structure and remove the DC bus bars.



6. Remove the four screws that secure the capacitor to the power structure and remove the capacitor.



Installing the DC Bus Capacitors

Install the DC bus capacitors in reverse order of removal, while referring to Torque Specifications on page 3-2.

Notes:

Start-Up After Repair

ATTENTION: Power must be applied to the drive to perform the following start-up procedure. Some of the voltages present are at incoming line potential. To avoid electric shock hazard or damage to equipment, only qualified service personnel should perform the following procedure. Thoroughly read and understand the procedure before beginning. If an event does not occur while performing this procedure, Do Not Proceed. Remove Power including user supplied control voltages. User supplied voltages may exist even when main AC power is not applied to then drive. Correct the malfunction before continuing.

Loading the 700H EEPROM

If you replace the Output Power Modules or Control Board in a 700H drive you must load information about the Power Modules or Control Board into the Power EEPROM. Contact Allen-Bradley Drives Technical Support for instructions and software tools for performing this operation.

Phone	United States/ Canada	1.262.512.8176 (7 AM - 6 PM CST) 1.440.646.5800 (24 hour support)
	Outside United States/Canada	You can access the phone number for your country via the Internet: Go to http://www.ab.com Click on *Support* (http://support.rockwellautomation.com/) Under *Contact Customer Support*, click on *Phone Support*
Internet	⇒	Go to http://www.ab.com/support/abdrives/
E-mail	⇒	support@drives.ra.rockwell.com

Be prepared to provide the following information when you contact technical support:

- Product Catalog Number
- Product Serial Number
- Firmware Revision Level

Before Applying Power to the Drive

1. Check the DC bus voltage at the Power Terminal Block by measuring between the +DC and -DC terminals, between the +DC terminal and the chassis, and between the -DC terminal and the chassis. The voltage must be zero for all three measurements.
2. Perform the forward and reverse biased diode tests using a digital multimeter. Refer to Conducting Forward and Reverse Biased Diode Tests for Major Power Components on page 2-3.

Testing Without the Motor

This test allows you to measure several operating parameters and diagnose problems without connecting the motor to the drive.

1. Verify that the input power wiring and grounding is connected.
2. Verify that the motor cables are disconnected.
3. Energize the drive.
4. Measure the DC bus voltage and verify that the value is reflected in:
   - parameter 306 [DC Bus Voltage] (700S)
   - parameter 012 [DC Bus Voltage] (700H)
5. Make configuration changes that allow the HIM to issue start and speed commands.
6. Make configuration changes that allow operation without an encoder and motor.
7. Start the drive, by pressing  (the start button).
8. Increase the speed command from zero to base speed, by pressing  (the up button).
9. Measure the output voltage on each phase and verify that it is balanced. If it is unbalanced troubleshoot the drive.
10. Stop the drive, by pressing  (the stop button).
11. Re-configure the drive to suit the application.

Performing the Power Circuit Diagnostic Test on a 700S Drive

The Power Circuit Diagnostic Test on the 700S drive allows you to diagnose problems in the drive's power structure without applying large amounts of power.

1. Verify that input power wiring and grounding is connected.
2. Verify that the motor cables are connected.
3. Energize the drive.
4. Measure the DC bus voltage and verify that the value is reflected in:
   - parameter 306 [DC Bus Voltage]
5. From the Monitor menu on the HIM press Esc (the escape button) to navigate to the Main menu.
6. Use ▼ (the down button) to move the cursor to the Start-Up selection, and press ↵ to select Start-Up. Then press ↵ again to verify your intention to continue with the Start-Up menu.
7. Use ▼ (the down button) to move the cursor to Power Circuit Diagnostics (Pwr Circuit Diag), and press ↵ to select Power Circuit Diagnostics.
8. Press | to begin the Power Circuit Diagnostic routine. Follow the indications and instructions on the HIM.

Testing With the Motor Without a Mechanical Load

This test allows you to measure several operating parameters and diagnose problems without connecting the motor to its mechanical load.

1. Verify that input power wiring and grounding is connected.
2. Verify that the motor cables are connected.
3. Verify that the motor load is disconnected.
4. Measure the DC bus voltage and verify that the value is reflected in:
   - parameter 306 [DC Bus Voltage] (700S)
   - parameter 012 [DC Bus Voltage] (700H)
5. Energize the drive.
6. Start the drive and increase the speed from zero to base speed.
7. Measure the drive output current and verify that the value is reflected in:
   - parameter 308 [Output Current] (700S)
   - parameter 003 [Output Current] (700H)
8. Stop the drive.

Service Tools and Equipment

Software Tools

DriveTools™ SP, DriveExecutive, DriveExplorer™ and DriveObserver™ are software tools for uploading, downloading and monitoring system parameters.

Service Tools

This list of basic service tools which will cover needs of tools for repair and maintenance measurements.

Item	Description	Details
1	Oscilloscope	Portable, digitizing, dual channel scope, with isolation
2	Current clamp	1000A(ac, rms), signal output
3	Soldering station	Soldering / de soldering
4	Adjustable power supply	0...1300Vdc, 1A, adjustable current limit. Efore LPS 750-HV or equivalent.
5	Adjustable power supply	0...690Vac (+10%), 10A, three phase, galvanic isolation
6	Multi meter	Digital multi meter, capable of ac and dc voltage, continuity, resistance, capacitance measurements, and forward diode bias tests. Fluke model 87 III or equivalent.
7	Insulation tester	1000Vdc
8	Torque wrench	1...12Nm
9	Torque wrench	6...50Nm
10	Box wrench	7mm, 8mm, 10mm, 13mm, 17mm, 19mm, 22mm
11	Socket extension	230mm
12	Wrench	7mm, 8mm, 10mm, 13mm, 17mm, 19mm, 22mm
13	Wire cutter	
14	Nose pliers	
15	Crimping tools	For cable terminals 1,5...240
16	Angle wrench	
17	Screw driver	
18	*Flat nose	7*2(mm)
19	*POZIDRIV	#1, 2, 3
20	*Phillips	#1, 2, 3
21	*Torx	#25
22	Hexagonal wrench	#4, 5, 6
23	ESD-protected place of work	Working surface, Floor covering, seat and ground connections
24	ESD-protective clothing	Wrist wrap, shoes, overall clothing (coat)
25	20-MAINSTND maintenance stand	Maintenance stand for removing power structure from drive cabinet
26	Fiber-optic repair kit	Agilent HFBR-4593 Polishing Kit, consisting of a Polishing Fixture, 600 grit abrasive paper and 3 mm pink lapping film (3M Company, OC3-14). For Agilent HFBR-4532 latching connectors and HFBR-RL cable. Refer to Agilent publications 5988-9777EN and 5988-3625EN.

Notes:

Schematics

List of Schematic Diagrams

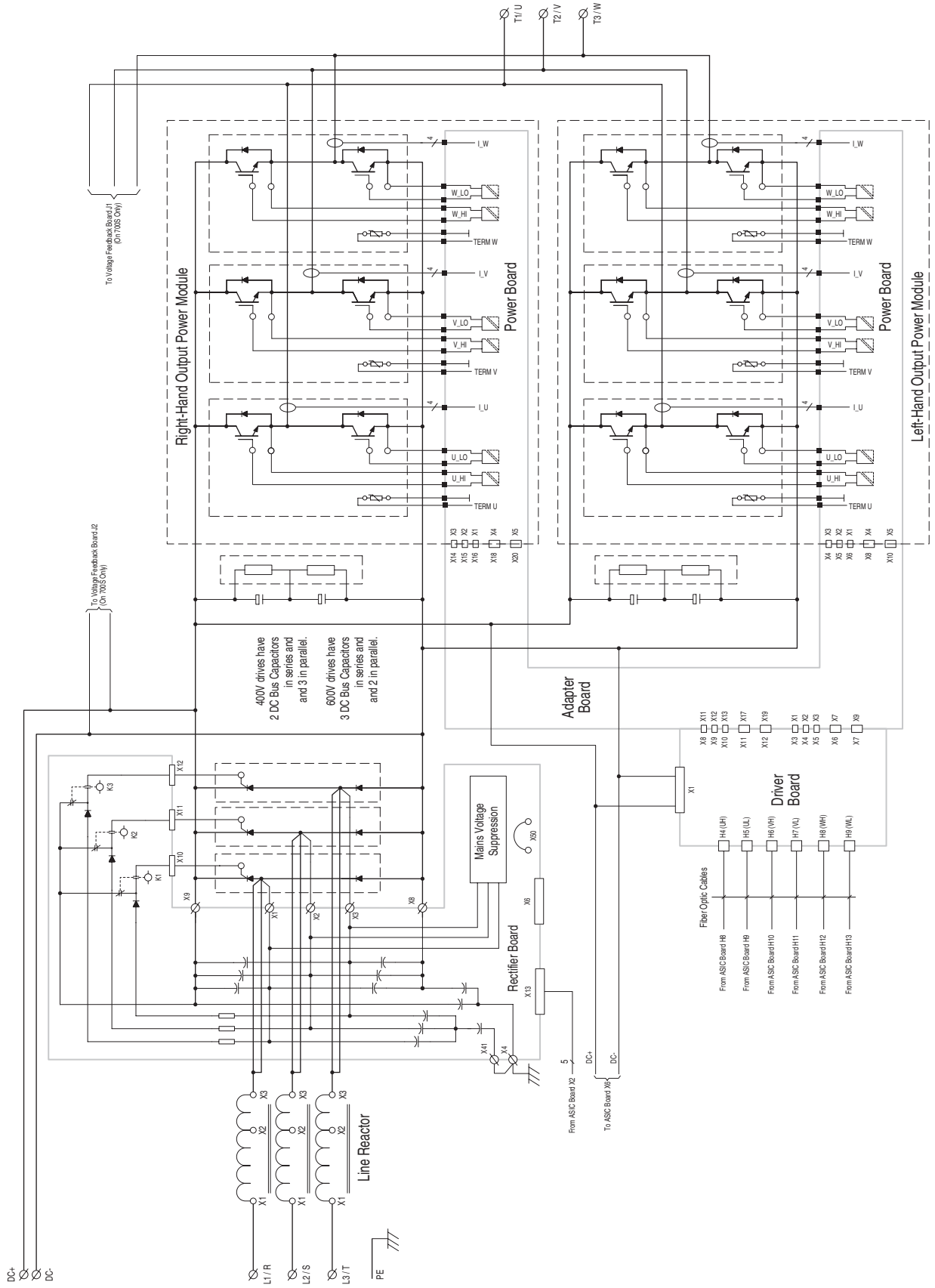


Figure B.1 Power Circuitry for Drives with AC Input

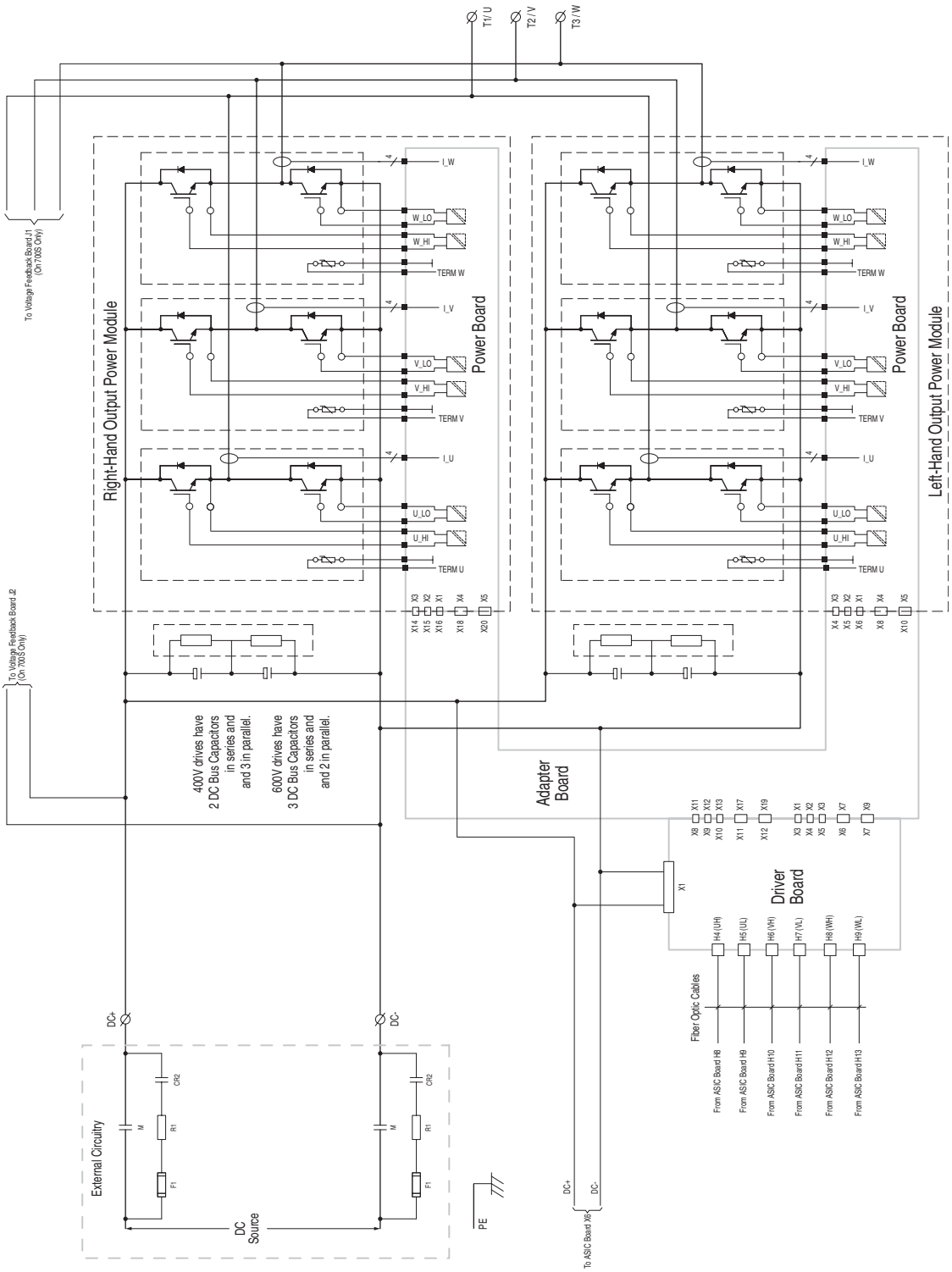


Figure B.2 Power Circuitry for Drives with DC Input

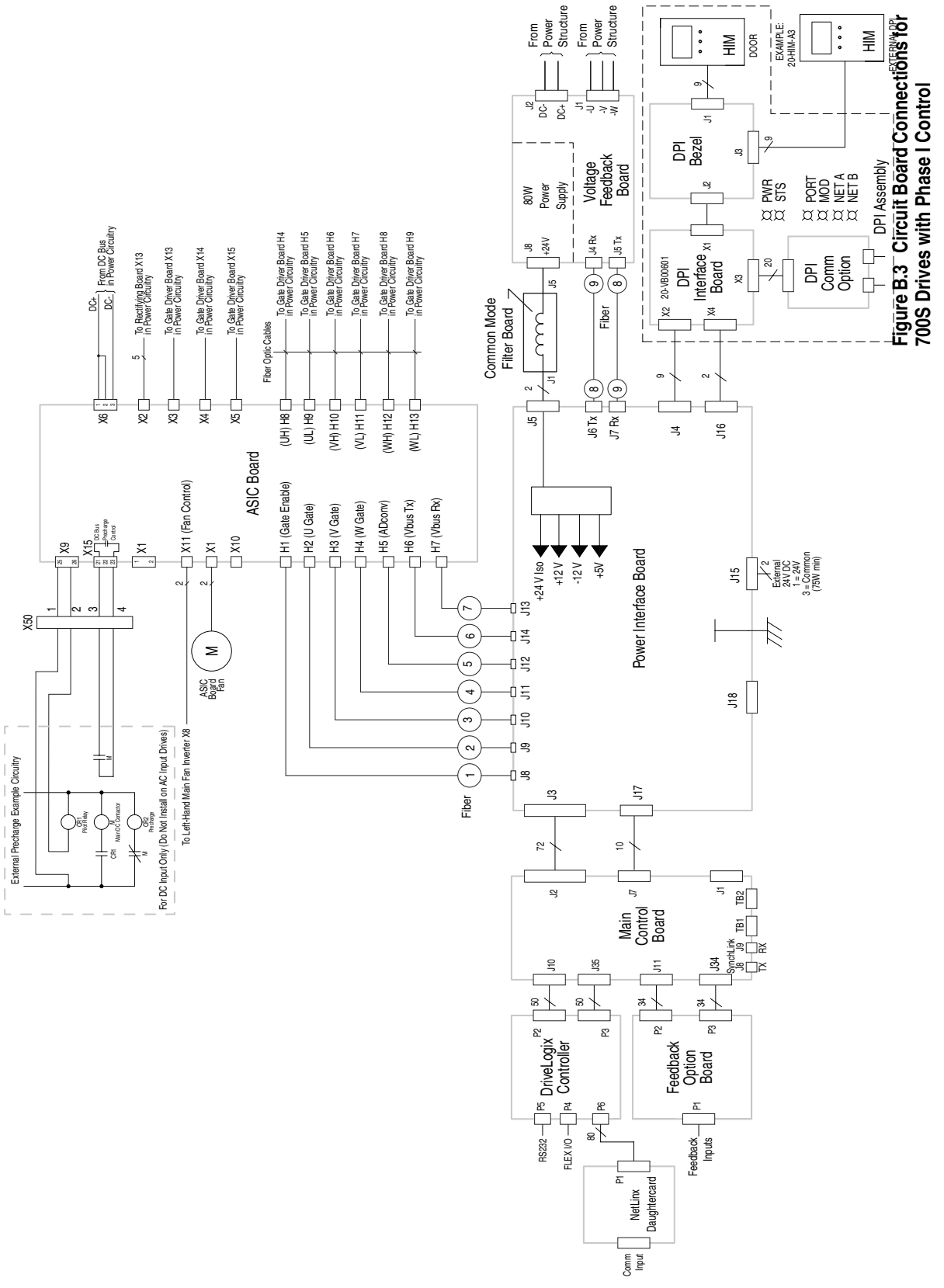


Figure B.3 Circuit Board Connections for 700S Drives with Phase I Control

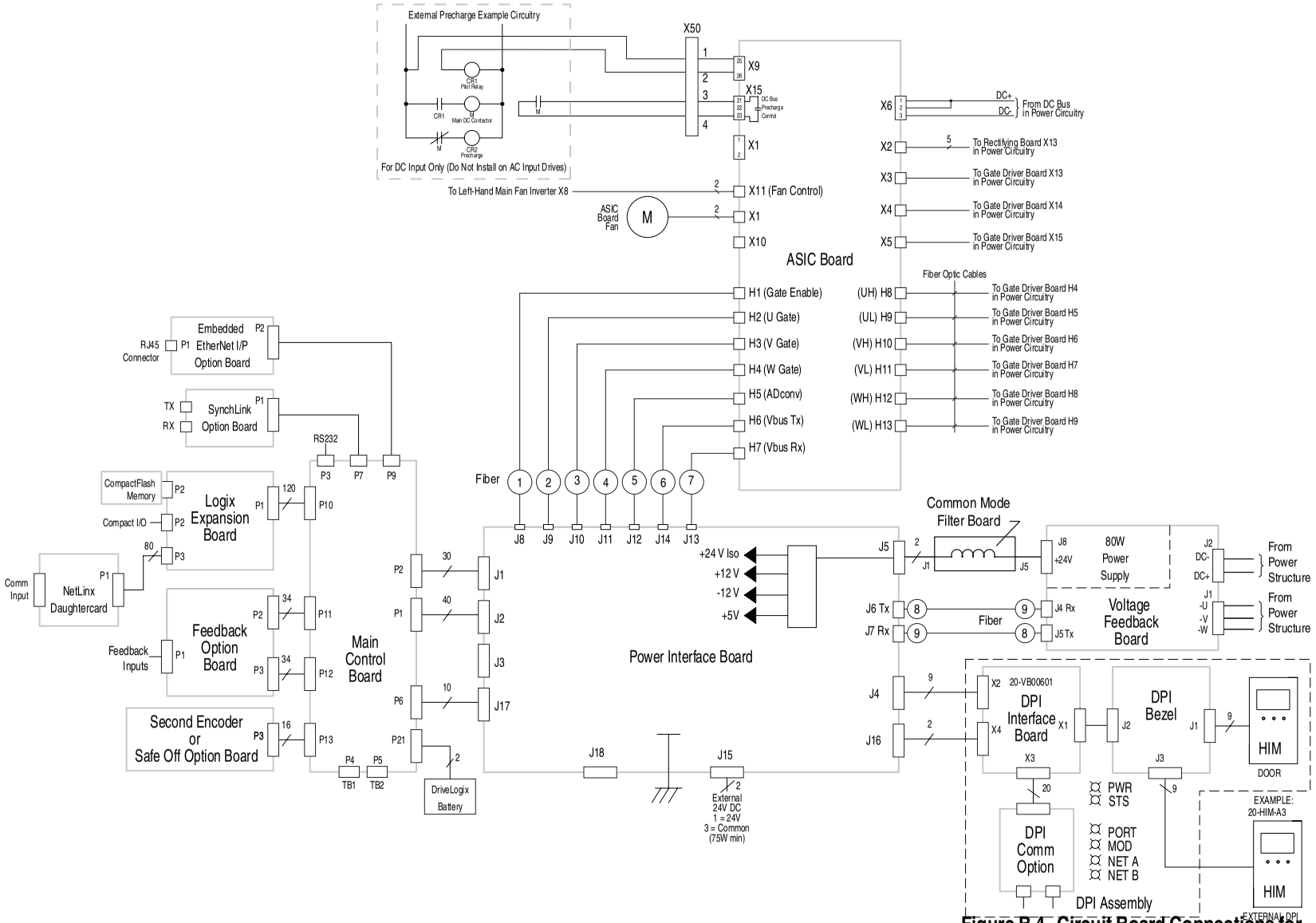


Figure B.4 Circuit Board Connections for 700S Drives with Phase II Control

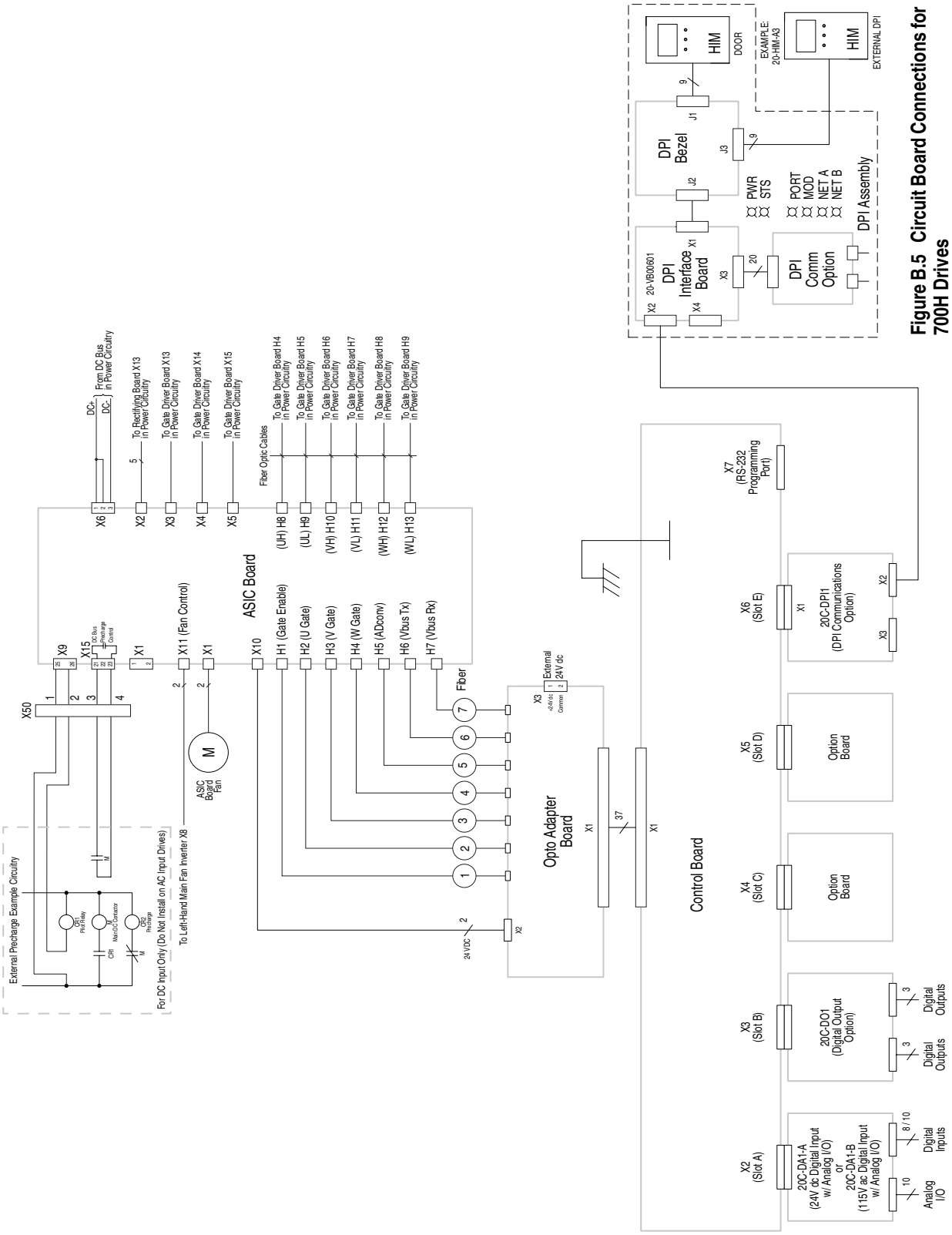


Figure B.5 Circuit Board Connections for 700H Drives

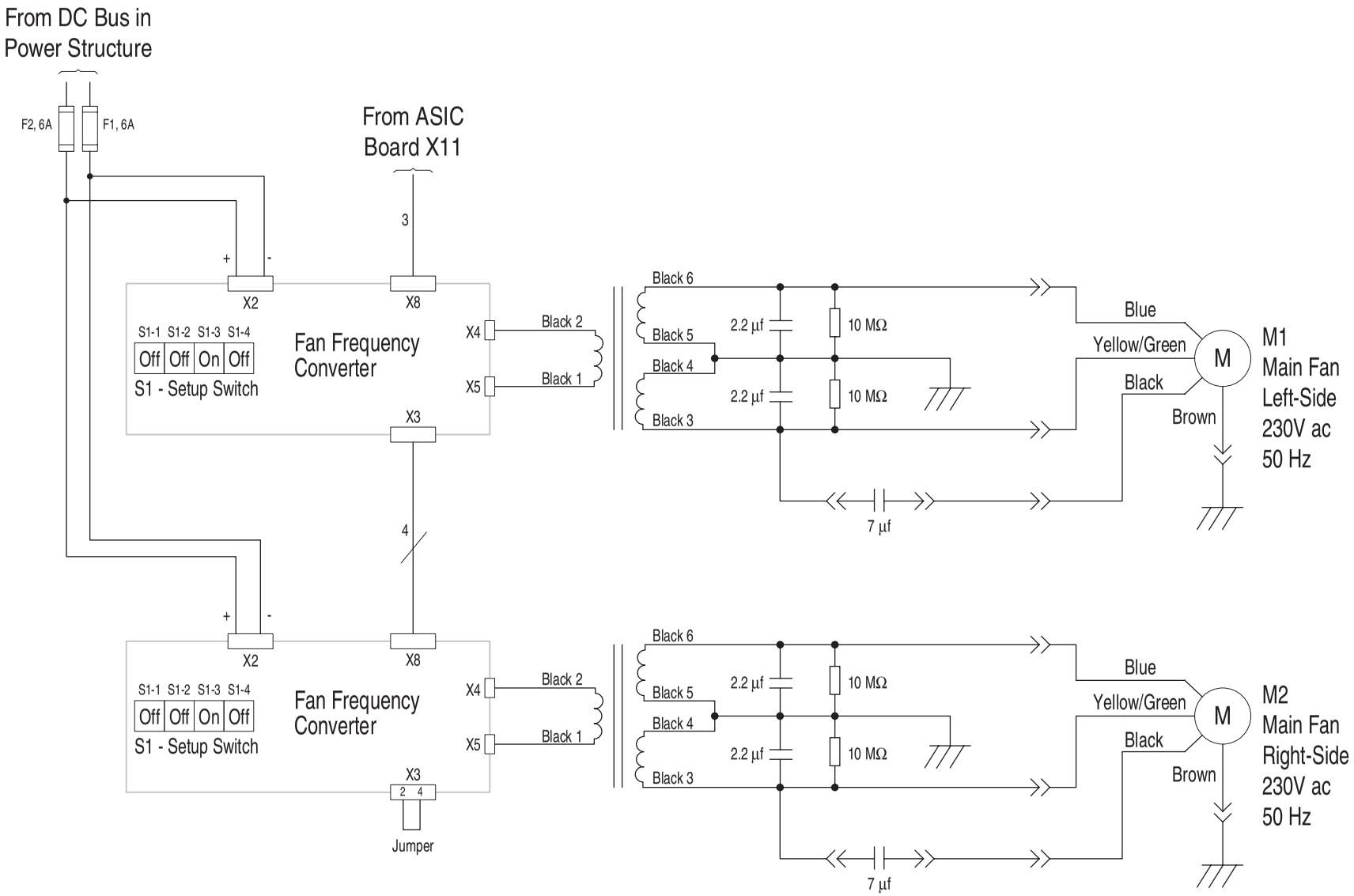


Figure B.6 Fan Inverter Connections

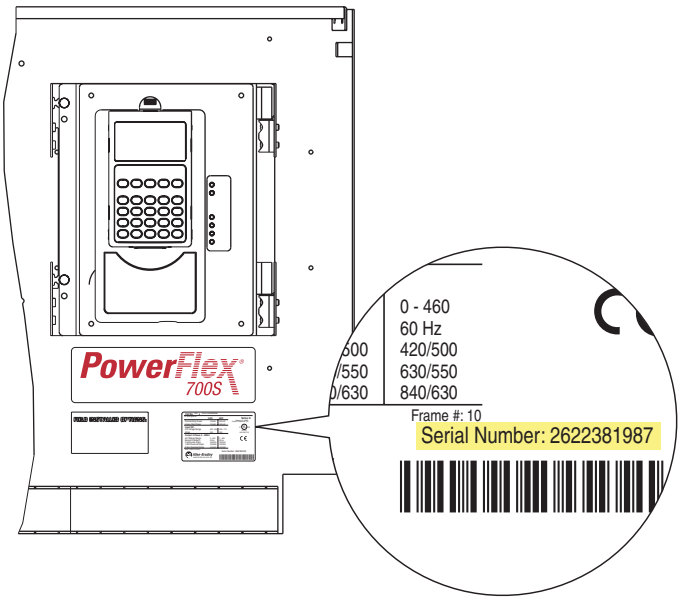
Notes:

Disassembly / Assembly Diagrams

Disassembly/Assembly Diagrams and Spare Parts Numbers

Diagrams on the following pages illustrate disassembly and assembly of the drive and its sub-systems and are followed by a list of spare part numbers where applicable.

When ordering spare parts, you must provide the serial number of the drive. The serial number is located on the data nameplate on the Control Frame just above the bar code.



A complete list of spare parts for PowerFlex 700S drives is available on the Allen-Bradley web site at:
http://www.ab.com/support/abdrives/powerflex70/PF7ReleasedParts.pdf

Figure C.1 Main Power Structure Assembly

ATTENTION: The sheet metal cover and mounting screws on the ASIC Board located on the power structure are energized at (-) DC bus potential high voltage. Risk of electrical shock, injury, or death exists if someone comes into contact with the assembly.

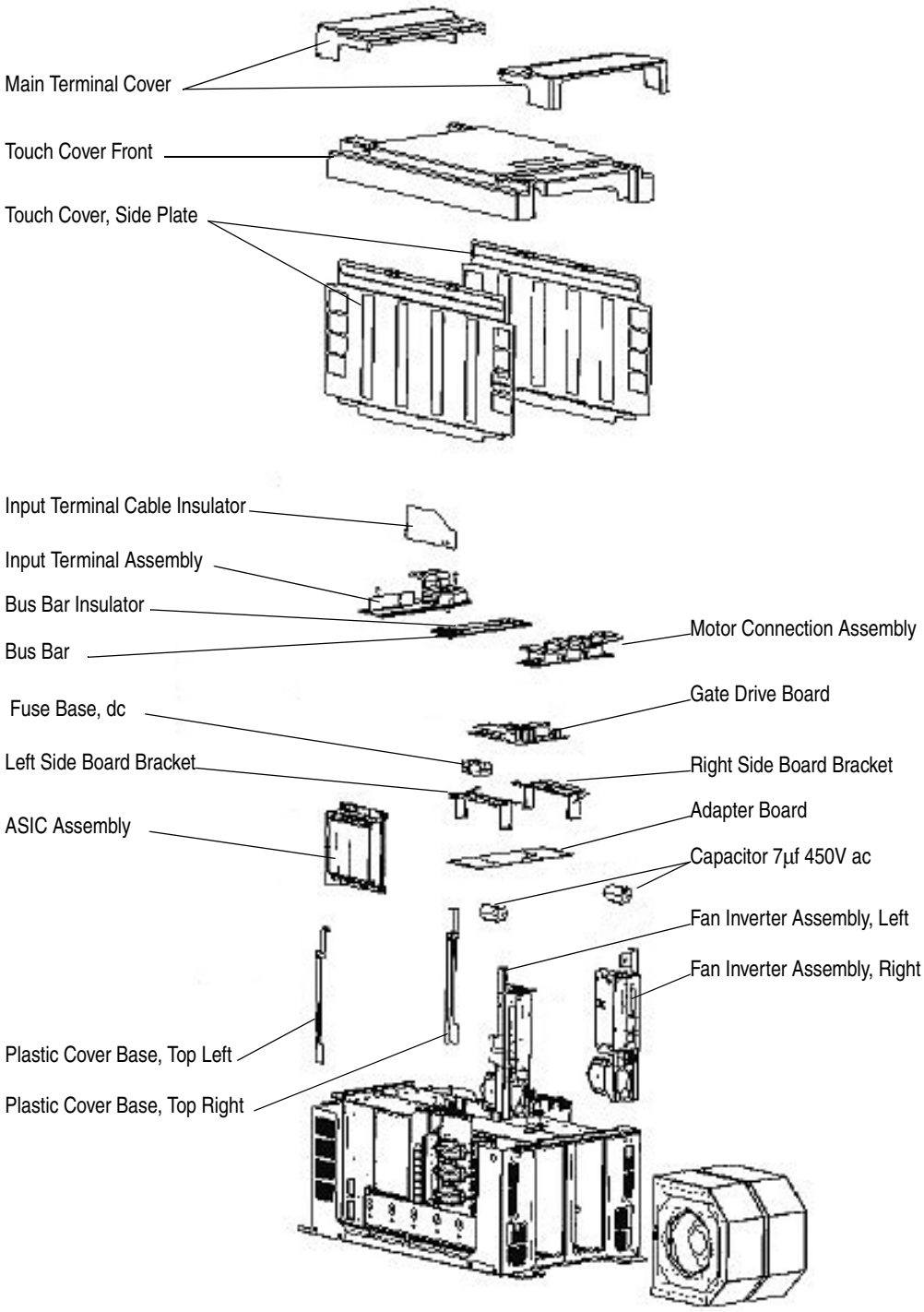


Table C.A Main Power Structure Assembly Part Numbers

Part Name	Part Number
Bus Bar	NA
Insulator For Bus Bar	NA
Input Terminal Cable Insulator	NA
Input Terminal Assembly	NA
Plastic Cover Base Top Left	NA
Plastic Cover Base Top Right	NA
Left Side Board Bracket	NA
Right Side Board Bracket	NA
Touch Cover Front	NA
Touch Cover Side Plate	NA
Main Terminal Cover	NA
Fan Inverter Assembly, Left	20-FR10844
Fan Inverter Assembly, Right	20-FR10845
ASIC Assembly Upgrade Kit without the ASIC Board	20-FR10850
Motor Connector Assembly	NA
Capacitor 7μf 450V ac	20-PP00011
Fuse Base DC	20-PP01094
Adapter Board	20-VB00330
Gate Driver Board	SK-H1-GDB1-F10D

Figure C.2 Right-Hand Side of Power Structure

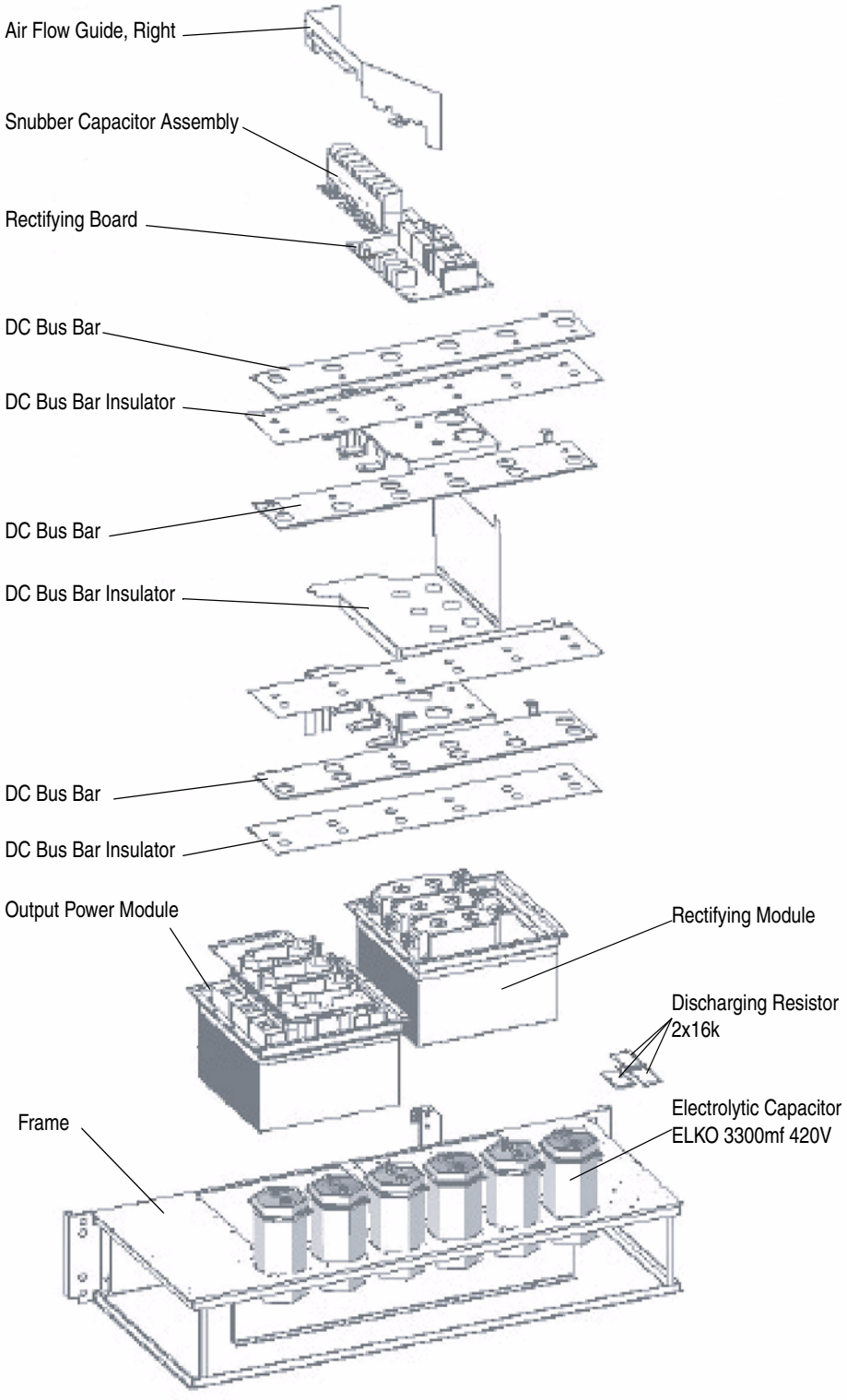


Table C.B Right-Hand Side of Power Structure Part Numbers

Part Name			Part Number
Frame			NA
DC Bus Bar Insulator			20-FR10027
DC Bus Bar Insulator			20-FR10028
DC Bus Bar			20-FR100044
DC Bus Bar			20-FR10052
DC Bus Bar Insulator			20-FR100143
Air Flow Guide, Right			NA
DC Bus Bar			20-FR10190
Series A Drive Discharging Resistor 2x16k			20-PP00056
Series B Drive Discharging Resistor 2x16k			20-PP13027
Series B Drive Precharging Resistors (not shown)			20-PP00066
Electrolytic Capacitor ELKO 3300µf 420V			20-PP01005
Snubber Capacitor Assembly			20-PP10019
Series A Rectifying Board	400/480V AC		20-VB00459
	600/690V AC		20-VB00460
Series B Rectifying Board	400/480V AC		20-VB00461
	600/690V AC		20-VB00462
Output Power Module	400V Class	385 Amp	SK-H1-QOUT-D385
		460 Amp	SK-H1-QOUT-D460
		500 Amp	SK-H1-QOUT-D500
	600V Class	261 Amp	SK-H1-QOUT-E261
		325 Amp	SK-H1-QOUT-E325
		385 Amp	SK-H1-QOUT-E385
		416 Amp	SK-H1-QOUT-E416
Rectifying Module	400V Class		20-FR10820
	600V Class		20-FR10821

Figure C.3 Left-Hand Side of Power Structure

ATTENTION: ASIC Sheet Metal and Mounting Screws are at DC Bus Potential. Contact may cause electric shock, injury or death. Disconnect all sources of power before touching any metal parts.

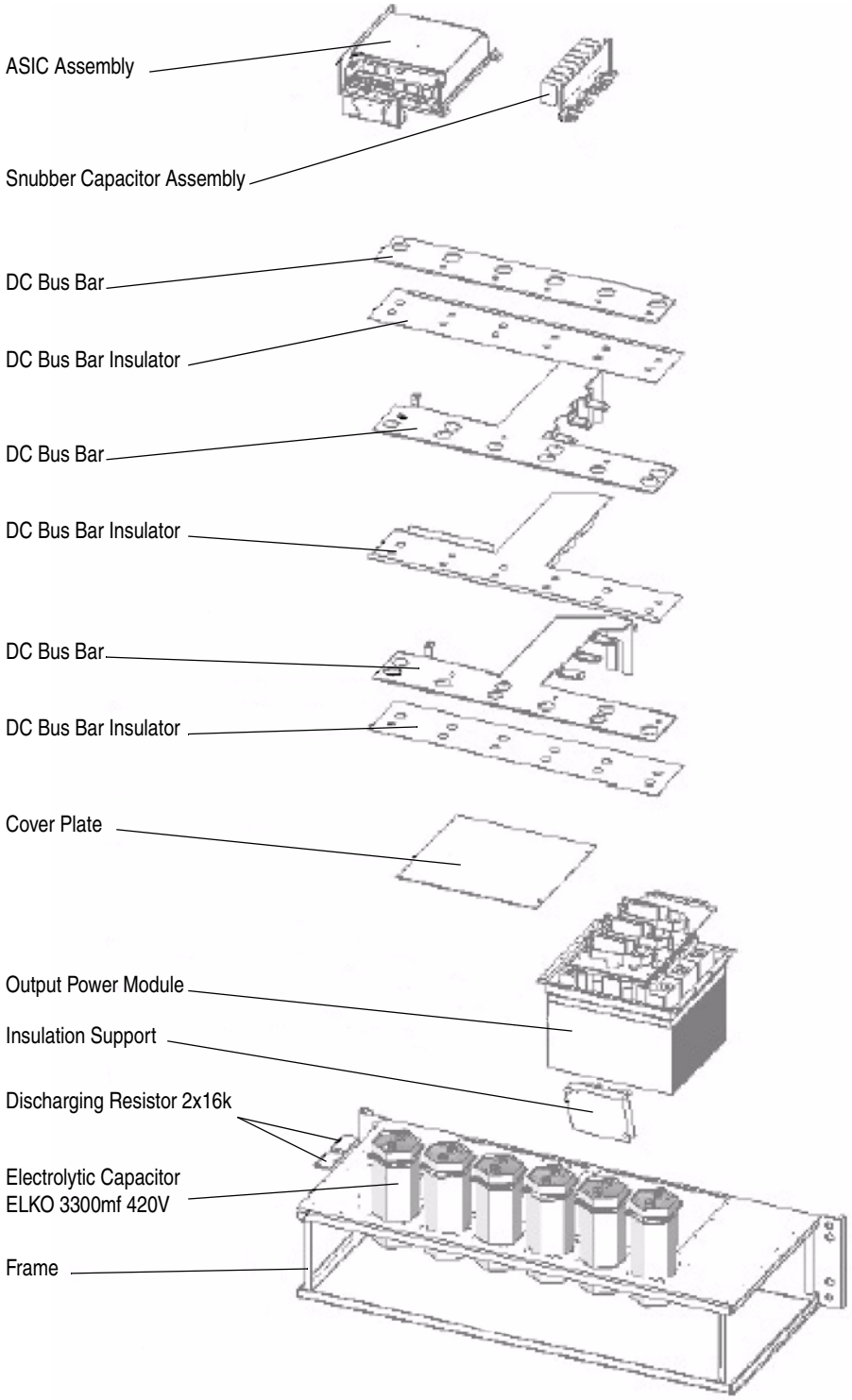


Table C.C Left-Hand Side of Power Structure Part Numbers

Part Name			Part Number
Cover Plate			NA
Frame			NA
DC Bus Bar Insulator			20-FR10026
DC Bus Bar Insulator			20-FR10028
DC Bus Bar			20-FR10048
DC Bus Bar			20-FR10052
DC Bus Bar Insulator			20-FR100143
Insulation Support			NA
DC Bus Bar			20-FR10191
ASIC Assembly Upgrade Kit without the ASIC Board			20-FR10850
Series A Drive Discharging Resistor 2x16k			20-PP00056
Series B Drive Discharging Resistor 2x16k			20-PP13027
Electrolytic Capacitor ELKO 3300µf 420V			20-PP01005
Snubber Capacitor Assembly			20-PP10019
Output Power Module	400V Class	385 Amp	SK-H1-QOUT-D385
		460 Amp	SK-H1-QOUT-D460
		500 Amp	SK-H1-QOUT-D500
	600V Class	261 Amp	SK-H1-QOUT-E261
		325 Amp	SK-H1-QOUT-E325
		385 Amp	SK-H1-QOUT-E385
		416 Amp	SK-H1-QOUT-E416

Figure C.4 Fan Inverter Assembly

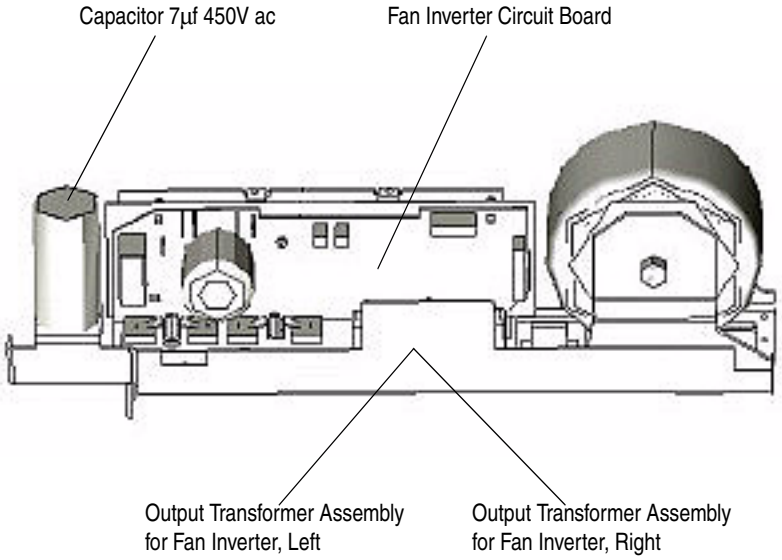


Table C.D Fan Inverter Assembly Part Numbers

Part Name	Part Number
Output Transformer Assembly for Fan Inverter, Left	20-FR10844
Output Transformer Assembly for Fan Inverter, Right	20-FR10845
Capacitor 7µf 450V ac	20-PP00011
Fan Inverter Circuit Board	20-VB00299

Figure C.5 ASIC Assembly

ATTENTION: ASIC Sheet Metal and Mounting Screws are at DC Bus Potential. Contact may cause electric shock, injury or death. Disconnect all sources of power before touching any metal parts.

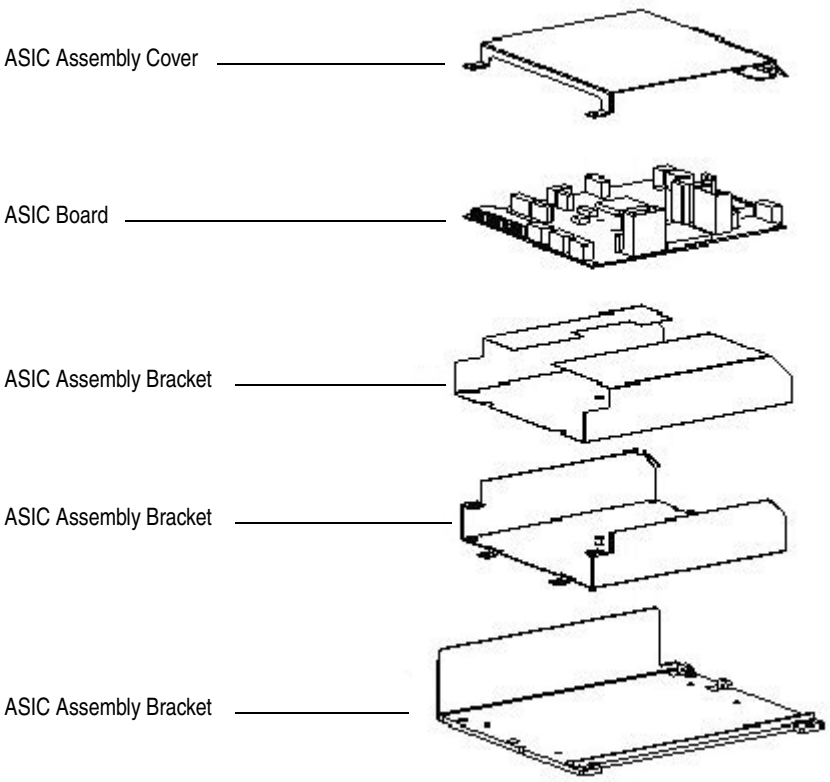


Table C.E ASIC Assembly Part Numbers

Part Name			Part Number
ASIC Board	400V Class	385 Amps	SK-H1-ASICBD-D385
		460 Amps	SK-H1-ASICBD-D460
		500 Amps	SK-H1-ASICBD-D500
	600V Class	261 Amps	SK-H1-ASICBD-E261
		325 Amps	SK-H1-ASICBD-E325
		385 Amps	SK-H1-ASICBD-E385
		416 Amps	SK-H1-ASICBD-E416
ASIC Assembly Upgrade Kit without the ASIC Board			20-FR10850
ASIC Assembly Bracket			Included in 20-FR10850
ASIC Assembly Bracket			
ASIC Assembly Bracket			
ASIC Assembly Cover			

Figure C.6 Main Fan Assembly

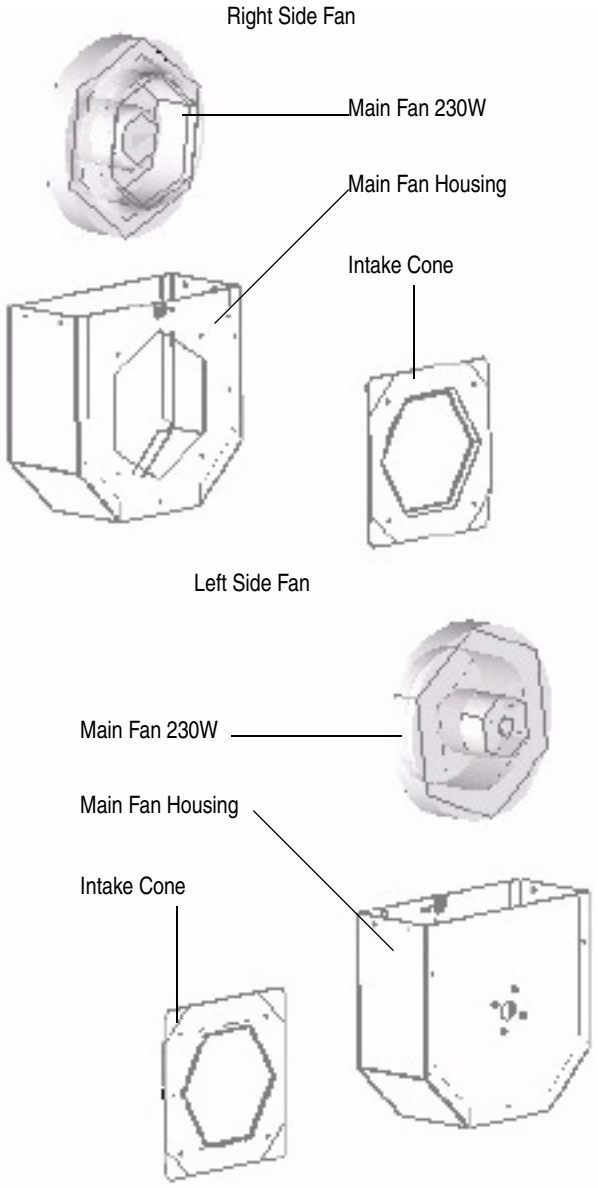


Table C.F Main Fan Assembly Part Numbers

Part Name	Part Number
Intake Cone	NA
Main Fan Housing	NA
Main Fan 230W	20-PP01080

Notes:

Numerics

A

C

D

F

G

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M

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P

R

S

T

V

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Publication PFLEX-TG002B-EN-P – December 2007
Supersedes PFLEX-TG002A-EN-P - July 2005